

THE WILDERNESS SURVIVAL GUIDE

THE PRACTICAL SKILLS YOU
NEED FOR THE GREAT OUTDOORS



JOE O'LEARY

Joe O'Leary has had a passion for spending time in wild places since he was a child. Eight years of military service developed these early experiences into useful skills, and after leaving the army Joe carried on learning the art of survival from some of the best bushcraft instructors in the UK. He runs his own company, Wilderness Survival Skills, which teaches bushcraft from basic to advanced level.

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WATKINS PUBLISHING
LONDON

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ACKNOWLEDGEMENTS

I would like to thank all the teachers, trainers and instructors who have kindly passed on their knowledge and expertise to me over the years and served as an inspiration in all manner of ways. Especially my Nan, who was always a Girl Guide at heart. She bought me my first proper 'survival' book. I would have loved to have given her this one in return.

Also, my family, friends and fellow instructors, who kept me on the straight and narrow while writing this book with their valued feedback and honest opinions.

I would like to thank Kev Palmer, a highly experienced bushcraft instructor and man of the woods himself, for scribbling away day and night to provide the illustrations.

In particular I must thank my wife, Clare, who has propped me up with regular strong coffee, chocolate biscuits on tap and amazing magic meals that appear from nowhere.

Lastly, to my most recent source of inspiration and motivation – my soon-to-be appearing son, who still has no name: I hope you enjoy the woods as much as I do, but if you don't ... well, that's ok. We'll play football instead.

INTRODUCTION

This book provides a guide to surviving in the wilderness. But how is a 'wilderness' defined? It is often identified as a vast and barren area, a wasteland. It is also thought of as a wild, untamed, endlessly harsh and dangerous environment. Neither version sounds like an ideal holiday destination that any sane person would want to spend their time in! It is, however, an undeniable fact that some of us regularly seek out the extreme and testing conditions that the wilderness provides. We are tempted away from a comfortable life, where we have pretty much everything we need, to spend our spare time in wild places – often the wilder the better! If we can't manage to get there physically, we spend our time dreaming about being there, planning trips and immersing ourselves in stories of other people's daring adventures in the great outdoors. We hear exciting tales of overcoming adversity and hardship, resilience, ingenious improvisation, mental and spiritual fortitude, which are all admirable qualities in our fellow humans. Inspired by these tales, people go there to prove themselves, develop their strengths and expose any weaknesses. But we also hear stories about the beauty, the peace and the quiet, the unhurried pace and the freedom the wilderness allows, and so others visit for solitude, isolation, somewhere they can clear a fuzzy head and recharge their batteries.

A wilderness means different things to different people and they seek it out for many varied reasons. For myself, spending time in wild places, wherever they might feature on the 'wilderness scale', provides a much-needed reality check, bringing me right back down to earth. The rules of nature seem to be clear and simple, the limits easier to define. I can see the immediate effects of my actions and I know that my decisions alone are all important to my comfort and continued existence. It gives me total control over my life again. Unimportant issues are filtered out, leaving only those elements that really matter.

The basic skills required to survive in the wilderness are easily attainable and allow plenty of room for self-discovery. They also seem to make more sense in our lives, to be a more natural use of our time. Surprisingly, some of the more ancient skills feel completely normal, almost like a distant memory that has been reawakened. They're easier to decipher than many aspects of modern life, being written in a language ingrained deep within us that we understand. Learning these skills helps us to reassess what is truly important. When there's nobody pumping light, heat and water into your home in exchange for tokens, you must take care of these basic needs yourself. These skills are not only empowering, they also allow us to redress the balance and think more about the consequences of our actions. The knowledge we gain helps us to become familiar once more with the wild resources surrounding us. They gradually form an integral part of our lives, and so are appreciated and treated with respect, ensuring their own survival. We understand our position in the bigger picture and a little more about what makes us who we are today.

This book provides a guide to some of the most vital skills required to survive in the wilderness, but it's important to realize that the aim is not to fight against it, more to survive alongside it. This is a more sustainable solution in most cases. The information detailed in this book has helped me immensely in my everyday life as well

as enhancing my enjoyment of the great outdoors, and I have not included any technique that I do not regularly use or have not tried myself at some point or another. Many of the skills detailed have proved useful in a variety of different environments and situations. This is not, however, an encyclopedic reference of potential disaster scenarios to treat as an instruction booklet when things start to go wrong. The information provided is intended to help you develop a solid universal foundation of realistic and achievable skills that are transferable to almost any environment.

With regards to your own personal safety, the skills discussed here are best learned at your own pace and in your own good time, so that you can really master and understand them. Don't wait until they become essential to your immediate survival to explore them for the first time – get out there and practise! However, any long journey starts with a single step, and if you aren't already familiar with spending time away from civilization and emergency help, be aware that most life-threatening situations can be avoided entirely by having some basic navigational and first-aid training. This is something that I am assuming everyone venturing into the great outdoors will have. These subjects are, primarily, best learned first-hand rather than entirely from a book and will ensure that you can safely enjoy forging a firm and lifelong relationship with your version of the wilderness.

CHAPTER 1

BEING PREPARED

The survival kit in your head and the one on your back

One aim of this book is to encourage a realistic attitude to survival and the ability and confidence to cope with certain situations. As the Boy Scouts' motto states, we should always 'be prepared'. This statement can be interpreted in different ways. Some people assume that this means we should be physically prepared and carry a small survival kit at all times containing a selection of useful items designed to aid the survivor in any situation, anywhere in the world. As long as you're likely to have this mini kit when you need it, this is better than doing nothing at all and will certainly offer an advantage with regards to equipment.

Some people take it to the extreme, however, and I've been down this route myself in the past, hiding little survival kits all over the place to give myself the edge should such a situation ever arise. I would carry a big survival kit in my rucksack, another smaller kit in a pouch on my belt and a miniature selection of emergency items in a pouch around my neck that should always be with me, wherever I was. Then there was the huge kit in my vehicle, tins of beans in the garage, and so it went on. I have also read about people who have little caches buried and hidden away all over the country.

Whilst this level of preparedness could possibly turn out to be a good investment of time and effort if the oil runs out sooner than expected (in which case the people to try and become friends with will probably be the ones unable to hide their big, smug cheesy grins), it's also probably bordering on the obsessive. I know this feeling well and have experienced a slight level of panic before when, in certain situations, I've realized that I haven't got any survival equipment with me even though it's very unlikely to be needed. In my own experience, this total reliance on kit and gadgets can be extremely limiting and doesn't promote or develop the type of improvisation and clear lateral thinking that seems more likely to be the saviour of the day when a sticky situation does come your way. I'm not suggesting a total lack of equipment preparedness though, and of course it makes a lot of sense to get into the habit of carrying a few key items that could give you a helping hand, so long as you don't let yourself become dependent on them.

A SURVIVAL MINDSET

To me, being prepared or preparedness is an attitude and a feeling of confidence in my own abilities. This confidence comes from the knowledge that I have practised my skills, preparing for the worst but hoping for the best!

This is the survival kit you will always have with you. I can't honestly say that I've ever been in a true survival situation, although I'm sure I've been in plenty of potential ones had I not been prepared beforehand. I have, however, been able to offer my help on more than one occasion to those who have been less prepared, and while I don't

pretend to have all the answers, here's a list of tools that I carry in my 'mental' survival kit ...

Having a 'can-do' attitude

The word 'can't' shouldn't feature in your vocabulary. In any situation that arises, no matter how minor or horrendous, you should always look for a way round it, or through it. This is not blind optimism, though, more like a realization that there's often a solution to most problems and you just need to find it. Try to think of someone you know who seems to be good at making things happen and imagine what they would do in the same situation. 'Find a way or make a way!' is a good thing to mutter to yourself in these circumstances, no doubt through gritted teeth.

Being self-reliant

Don't constantly look to others for help. Although there's a lot to be said for teamwork, and in certain situations it can even be dangerous to stubbornly refuse assistance, possibly putting everyone else in danger as well as yourself, you should always try to take responsibility for your own actions. A good example here is the hill walker who only carries a mobile phone as their 'survival kit', showing a total reliance on mountain rescue teams to carry them home to safety should anything go wrong. Much better to ensure that the chances of finding yourself in trouble are minimized by checking the weather reports before a trip and having a plan to follow one of several short cuts or escape routes back to safety. Get used to noticing potential risks before they develop into life-threatening situations and aim to become experienced enough to decide on the correct course of action. Your own physical condition is important too. Not everyone can be an Olympic athlete, but you can aim to be as fit and physically capable as it is possible for you to be. Being as fit and healthy as YOU can be is a useful tool and important in almost all of the following areas.

Keeping a clear head

If you are someone who collapses into screaming, fist-pounding hysterics when your friends forget your birthday, then perhaps now's the time to think about getting things into perspective. Count to ten and think again! Develop an attitude of 'Oh well, it could be worse'. Conversely, if you seem to remain completely calm and ultra relaxed at all times to the point where you haven't got the presence of mind to think on your feet and formulate a sensible plan fast, then you may want to give yourself a shake and develop a sense of urgency that can be called on if needed. Mild panic, which lies in between these two extremes, is good as long as it acts as the trigger to 'up your game'. People train to become better at making good decisions under pressure: it is a skill that can be developed.

Being adaptable and able to improvise

More often than not, things won't go to plan. Based on my own experiences of life, I can say with confidence that nothing ever goes strictly to plan, so allow for this and try to make sure you always have a plan B. I have always been most impressed by the ingenious ways in which people have been able to improvise a solution for a problem. I remember being full of admiration when my Dad fashioned a makeshift but very usable spoon by performing some improvised origami with the foil lid of my yogurt carton. I would probably have been less impressed if he had just happened to carry a teaspoon everywhere in his pocket.

'Screw the nut'

There will be times when, faced with a task you just don't want to do, you decide that you've had enough and the temptation to give up takes over. What are you hoping for: that someone else will do it for you instead? Other less capable people could be relying on your strength of character, so you must have the mental toughness to push yourself a little harder when all you really want to do is take it easy. Tighten that nut one more turn! This is definitely a good attitude to develop and comes into play quite often in everyday life. I'm not going to pretend that my life is one great big ultra-disciplined episode (I frequently leave the washing up until the next morning!), but when it's important I'll put aside the lazy me, realizing that if I can't be bothered to do a certain task it only means being uncomfortable later on or – even worse – having someone else do it instead. Often, by putting in the extra effort needed in certain situations, you're actually making life easier for yourself in the long term. Fire lighting with natural materials is a prime example of this.

Planning ahead

Being able to think several steps ahead raises a very important factor of survival success and that is never to waste precious energy. Every task we do requires a certain amount of energy expenditure, so if we're going about things in a random and inefficient fashion we're expending vital energy resources. Carry out a little 'time and motion' study on yourself. In the wilds, resources are often spread far and wide, so plan ahead and think about gathering as many resources as possible whenever you need to move away from camp. Also, be an opportunist: if you happen to come across a useful resource, such as good tinder, grab it when you see it rather than intending to come back for it later.

Training

Develop your skills and have an understanding of the priorities of survival. Shelter, fire, water and food are essential in the wild. Hopefully by reading this book you'll see that understanding and learning the skills and techniques necessary to obtain these important elements can be enjoyable and fun. It's possible to incorporate certain elements effortlessly into your life, with the added advantage of honing them for effective use if needed. Wilderness survival is a vast subject, splitting off at many different tangents and into many specialist areas.

To begin with, aim to be multi-skilled, a 'Jack of all trades'. Work at developing your knowledge and practical experience, taking it right back to a base level wherever possible. You will then always have your most important survival tool with you wherever you go: the self-confidence that comes with fully understanding and mastering the basic skills necessary for survival. After that, survival kits and equipment become less important and will just be seen as an added bonus in many situations.

EQUIPMENT FOR THE WILDERNESS

So, we've established that gear, equipment, kit, whatever you want to call it, isn't something that we should rely on or assume we'll have when we need it. Therefore it makes sense to practise skills and see how we can cope without it in different situations. After all, we're no different from our ancestors in our physical make-up, and they were able to find everything they needed to live on from the natural resources surrounding them. No breathable, wicking, fleece underpants for them!

However, ancient man did carry certain resources around with him that are difficult to find or vital for survival. For venturing out into the great outdoors in order to practise wilderness survival and bushcraft skills, therefore, we should also follow that example by ensuring that we're properly equipped for whatever comes our way (time permitting). Although I would always encourage people to see how they could cope without a bulging rucksack of shiny kit, we have to be sensible, and a basic set of items should always be carried just in case. And so we enter the vast, constantly changing and seemingly endless world of outdoor apparel and gear. If you're just starting out on this journey, bear in mind that every piece of equipment you carry should be something that performs more than one function if possible, is easily repairable by you, can fulfil the task you bought it to do for an extended period and can be replaced through improvisation should the need arise.

Clothing

Shelter (protection from the elements) is often thought of as being the first priority of survival. Our clothing provides us with mobile shelter from bad weather and a barrier from the sun's rays and other dangers such as thorns, biting insects and stinging plants. Within our layers we create a kind of microclimate where warm air is trapped next to the body, not whisked away by the cold wind. This microclimate tends to be more stable than the changeable conditions outside and is certainly more controllable by us. Our clothing choice depends entirely on where in the world we are, or intend to visit, and is often influenced by the changing seasons.

Over the years there have been many revelations in clothing technology, resulting in many different potential outfits for the whole range of changing environments that travellers are likely to find themselves in. When looking for guidance regarding which clothing is best, you will be bombarded with conflicting advice from all sides, mostly from the outdoor clothing companies advertising their wares. I've tried all sorts of outdoor gear since venturing into the outdoors, starting with the cheapest ex-army kit and a pair of my Dad's boots that were slightly too big and working my way through all

the latest hi-tech equipment and parting with a small fortune along the way. Having run out of credit cards to max out on, I eventually settled on a simple set-up that seems to cater for most environments, even making some of my own clothing and equipment to fit in with my exact requirements. For extremely cold, hot or wet environments, this basic kit remains the same, needing only a few tweaks and additions. If you take some inspiration from what I've learnt in regard to outdoor gear, you will hopefully be able to see what's really important and what amounts to excess baggage. You might even save yourself some cash.

WEATHERPROOF LAYER

This is your main barrier against foul-weather conditions, so think of the worst weather you are likely to be out in and opt for maximum protection before you consider whether or not the colour is going to clash with your rucksack.

Weatherproof jackets

Look for features such as large hoods with a stiffened peak to provide a kind of porch over your eyes and volume adjusters to achieve a snug fit around your face. Make sure the length gives maximum coverage even when you are bending over but isn't so long that it ends up being restrictive when you need to lift your legs over obstacles. As for the size: it should be big enough to take several warm layers underneath. Being able to roll up your sleeves is important, especially when dealing with dirty jobs such as preparing wild game to eat. Any opening, such as the hem, hood and cuffs, should have closure devices to pull it in nice and tight. Too many pockets mean more stitching to let in moisture, but an easily accessible zipped pocket designed to hold a map, compass and torch is a must. A couple of hand-warmer pockets on the hips are also useful. Any zips should be covered with a storm flap to keep out the rain, and if the zip pullers are a bit small, add a loop of strong cord so that you can operate them with gloved fingers in winter.

Although colour isn't as important as design, it is still a consideration. Specific activities call for specific colours: hunters will want muted or camouflage shades while mountain climbers will go for bright, easily seen colours for safety. If you've got a limited budget and want to invest in a good-quality jacket that will cover every eventuality, then go for something bright. You're most likely to be wearing it during foul conditions in open ground such as you might find up a mountain and would therefore want to be seen.

Weatherproof trousers

These should certainly be carried in mountain environments, where they're more likely to be worn from the outset, but aren't always necessary in the woods. They should, however, form part of your basic kit, as they can be useful when walking through tall, wet undergrowth and pressed into service as spare trousers should you need to wash your main pair. Mountain trousers are made to withstand heavy use and are therefore going to take up more room in your pack than a lightweight pair, so if you don't expect to spend all your time on a wind- and rain-swept mountain, consider the lightweight pair that can be easily stashed away in your kit. If the weather turns really bad, you'll

be delighted when you find them winking at you from the bottom of your rucksack. Even if you choose a lightweight option, make sure they can be pulled on over your boots and have a sensible drawcord around the waist. With heavier mountain trousers, I like to fit braces so they don't end up around my ankles when soaked with rain.

Waterproof ponchos

These are not really a replacement for a good waterproof jacket as they're awkward to work and move around in. On a mountain side in a storm there's a good chance you might even take off like a kite! However, they do make a brilliant emergency waterproof layer for less-active trips with a low chance of rain, as they can also be made into a pretty good lightweight shelter. Ex-military versions can be attached together to become an open-ended but roomy two-person tent.

Different fabrics and their qualities

For the last 25 years, jackets and trousers have been available in waterproof and breathable fabrics such as Gore-Tex®. Prior to this, waterproof clothing did provide a weatherproof barrier for the wearer but it also kept any moisture released as sweat inside the clothes. Wind and rain were kept at bay, but you would often still find yourself soaked through from condensation after any physical activity. Revolutionary breathable fabrics let your sweat escape while still providing protection from the rain. However, breathable fabrics can 'wet out' after prolonged use. This involves a gradual breaking down of the DWR (Durable Water Repellent) coating, the result of which is that the water droplets no longer 'bead' and roll off but soak into the outer fabric instead. Although no rain is actually getting through, the garment feels clammy and cold on the inside and this can affect the breathability if you're working hard. To compensate for this, always wear a wicking layer underneath made from a material that continues to provide insulation when damp.

Alternatives to Gore-Tex® are available, such as Ventile®, a densely woven, wind- and weatherproof cotton with interlocking fibres that swell up when wet, preventing more water from coming through. This interesting material has been in use since the Second World War, when it was developed for use in pilots' immersion suits; it was also used in Arctic exploration clothing and shelters. It has several advantages over modern fabrics for the bushcrafter: it won't melt if worn near a fire, it is more comfortable to wear for longer periods, it doesn't rustle in use and is fairly tough. Cotton does, however, lose any insulative qualities when it gets wet and actually conducts body heat away from the wearer, which means it needs to be worn over a base layer that retains warmth when damp, such as wool or fleece. A double-layer Ventile® jacket makes a good outer skin in cold conditions but can take a while to dry, so it is often made to have double layers on high-stress areas that require extra weatherproofing, such as the shoulders, hood and elbows. In warmer environments any nasty little biting insects will struggle to get through it, so as an all-round useful material it is certainly worth considering.

Pertex® is another wind- and showerproof material, which is extremely lightweight, breathable and quick drying. This makes it a good choice for lightweight windproof jackets but not as a serious weatherproof layer. When combined with a thick-pile

synthetic fleece inner, it works well in very wet, cold conditions by working on the principle that the cold wind is kept out but plenty of warm, insulating air is kept next to the skin, trapped amongst the thick pile. The fibre pile doesn't lose its insulative qualities when damp in the same way as cotton. Both the synthetic-fibre pile and windproof Pertex® layers are very fast drying and therefore dry remarkably quickly when the rain stops. This clothing system is designed to be worn next to the skin with no underwear and can take a bit of getting used to. If the weather turns extremely cold or you need to sit still for a while, then you just pull another similar top on over your damp layer. You will feel damp, but warm, a bit like wearing a neoprene wet suit. Sounds grim, but it's surprisingly toasty in bad conditions and a favourite for mountain rescue teams. Originally designed for mountain climbers in Scottish winter conditions and based on the fur inside layer worn by Arctic hunters, it's great for the active outdoors person. For bushcraft activities, you might want to add a single-layer Ventile® jacket as a tough, more fire-resistant outer layer.

For the most part, I use a homemade, single-layer, hooded Ventile® jacket, which keeps out the sort of weather you would expect to find getting through the leaf canopy overhead. This completely blocks any wind, and when worn over a woollen shirt in cold conditions, preserves my little microclimate of bodily warmth. It's tough enough to wear as a work layer and dries quickly when working around a campfire. In my pack I have an all-singing, all-dancing Gore-Tex® waterproof jacket and trousers squirrelled away for really bad conditions or excursions into open ground where I'm completely exposed to the elements. For an emergency kit or a lightweight set-up where you intend to spend all your time outdoors in the forest, a Ventile® smock with a waterproof, hooded poncho as your foul-weather back-up is a good system.

After countless soakings wearing all sorts of different clothing combinations, I've come to the conclusion that sometimes you just need to accept the fact that if it's raining and you're in the open for an extended period, then you're going to get wet whatever clothing you're wearing. With this in mind, the key points with any foul-weather clothing system are to have a good, tough, quick-drying, windproof outer layer that keeps the wind chill off, inner layers that retain insulation and warmth when damp and a dry set of inner clothing for changing into when you eventually make or find shelter. Don't put all your faith in an expensive waterproof layer – the rain finds a way in eventually. Be prepared for that soggy truth.

TROUSERS

Trousers need to be comfortable while also being tough. It also helps if they are made from a quick-drying material. Hip and thigh pockets are good features, as are drawcords on the ankles to keep out biting insects. Make sure your belt loops are wide enough to take a sturdy belt, and if you can buy trousers with big buttons or press studs on the leg pockets, you'll find them easier to use in cold conditions while wearing gloves. Trousers seem to take a lot of abuse – from kneeling on the woodland floor to forcing a path through thorns and brambles – so if you can find some that can cope with all of this and that aren't expensive, you're onto a winner. Ex-army combat trousers definitely fulfil most of these requirements and are becoming more frequently worn by all sorts of people, so eliminating the worry that you might look a bit like a mercenary. If you're feeling flush, you might want to invest in a pair of single-layer

Ventile® trousers. These have all the above qualities and can be worn all day, every day, as well as being incredibly weatherproof. Despite the fact that they are not being classed as truly waterproof, I've waded thigh high into rivers before with the ankle drawcords of my Ventile® trousers pulled tight around a pair of Gore-Tex®-lined leather boots without letting any water in!

INNER LAYERS

These will consist of a single base layer, which, in cold conditions, can be added to with slightly warmer layers on top to trap warm air and keep it next to the body. The base layer should be comfortable, as it is worn next to the skin. Make sure that tops are long enough to tuck in well and not ride up to expose bare skin when you bend over. Cotton should definitely be avoided, as it feels cold and has zero insulating qualities when damp due to either an external soaking or your own sweat. It's fine in hot conditions, though, for these very reasons.

Synthetic thermal underwear will keep you warm when it gets damp and dries very quickly, but it can melt when exposed to the heat of a campfire (or a tumble drier, as I discovered the first time I pulled a shrunken, doll-sized thermal top from within). It's also pretty stinky when worn for a few days and seems to retain the smell deep within its fibres (or perhaps that's just something to do with me).

Wool seems to be the all-out winner here. It has long been known as an incredibly insulating material, if a little itchy. Modern combinations using fine, soft merino wool mixed with Lycra® have revolutionized the thermal base-layer world in recent years by providing us with comfortable, insulating, warm-when-wet undies that can be worn for extended periods without smelling disgusting. Shop around, though, as some manufacturers seem to feel the need to charge you so much of your hard-earned cash for a pair of long johns that you would think the wool must have been sourced from the Golden Fleece of Greek mythology.

You'll get a lot of wear from a 200g/7oz merino wool crew-necked, long-sleeved top. I wear mine for most of the year. For colder conditions you might want to add long johns and use a slightly heavier-weight top with a button or zip-up neck. Having several layers in different weights gives you lots of options for varying conditions. Bodywarmers, or gilets, are good for keeping your core warm while still allowing plenty of movement for the arms, making them perfect as workwear in colder conditions.

INSULATING LAYER

While your inner layers are intended to keep you running at a certain temperature, your insulating layer is the garment you reach for when either the mercury plummets or you've stopped generating your own body heat through activity. In fairly dry, cold conditions this layer could also serve as a warm outer garment. Choose something with a hood or at the very least a high collar to keep the chill off your neck and head. This layer can take the form of a woolly jumper or shirt, a fleece or fibre pile jacket or, for really cold conditions, a duvet jacket.

Some wool garments are made from a very dense weave, which provides warmth as well as a degree of protection from the weather. These are superb for bushcrafting

because they are warm even when wet, tough, rustle free and very fire resistant – making them perfect for working in the woods. They are, however, bulky to pack, heavy to carry and difficult to dry if you haven't got an external heat source, so not recommended for mountain trips. If you're handy with a needle and thread, you might want to make your own hooded, pull-over smock from an old wool blanket. Wash the blanket on a hot wash before setting out the pattern, and it'll thicken up to make a more weather-resistant material to work with.

Fleece and fibre pile jackets are lightweight and warm as well as being quick drying. Trousers made from fleece are a cosy choice worn under a shell layer in cold conditions.

For maximum warmth but minimum weight and bulk, duvet jackets are the answer. These are filled with either duck or goose down or synthetic insulation, trapping loads of warm air, and have a windproof outer skin to stop that warmth being whisked away. Down jackets squash down incredibly small, bounce back to create good 'loft' in order to trap warm air and are ridiculously warm for their weight. However, they don't like damp conditions at all: the feather filling sticks together in clumps, leaving gaps and cold spots.

Synthetic insulation is almost as warm, though a little bulkier, but it performs slightly better in wet conditions, making it a good alternative. If you can find a synthetic-filled duvet jacket with a good hood that squashes down really small and weighs next to nothing, then it can live permanently in the bottom of your pack, safely nestled inside a waterproof bag, and you'll always have an ultra-warm layer should you ever need it.

Mountaineering folk sometimes carry a larger-sized synthetic-filled jacket to pull on over the top of outer layers when stopping for any length of time. This prevents further cooling because you don't have to strip off an outer garment in foul-weather conditions in order to pop a warm layer on. For working in the woods, you'll need a tougher jacket over the top to save your investment from being torn or holed by sparks from the fire.

If this all sounds like an awful lot of clothing to wear and lug around, it's worth bearing in mind that when travelling in wild places you should always have enough of the right sort of clothing to enable you to sit out an overnight storm without an external heat source, in relative comfort, even in the harshest conditions.

IMPROVISATION

If you find yourself without suitable clothing for the environment you happen to be in, then you can always improvise. Dry grass and other dry plant materials and feathers (if you can get enough of them) can be used in a similar way to the filling inside a duvet jacket by stuffing them inside your clothing to create space to trap warm air. Don't be a slave to modern ways of thinking. People have survived and thrived in extremely harsh environments without a hint of Gore-Tex® or synthetic fibres for millennia (or we wouldn't be here). Many high-street outdoor clothing designs are based on traditional patterns taken from Arctic clothing, and furs and animal hides often out-perform modern materials in extreme environments. Even plant fibres have been used to provide protection from the elements: from woven bark shoes and hats to grass-matting capes, such as the preserved fragments found high in the Alps alongside Ötzi, the 5,000-year-old mummified mountaineer.

EXTREMITIES

Often the parts that are most susceptible to weather-related injuries, your extremities need to be well looked after too.

Hats

When you're feeling cold, the first thing you should do is pull on a warm hat. An unbelievable amount of body heat is lost through an exposed head and neck. In cold conditions, a wool or fleece hat that can be pulled down to cover the ears should always be carried or worn, with a spare in your pack. Some excellent models are available with fleece-lined ear flaps and waterproof, breathable outer skins. In really cold weather you might want to upgrade to a balaclava for full-face coverage. Warm-weather headwear should be lightweight and breathable with a good brim to provide shade from the sun.

Scarves or snoods

These are a welcome addition in winter. I carry a merino-wool headover (long, stretchy, wool tube) in my kit all year round, as it takes up virtually no room at all and can be used as a spare hat when rolled up, a scarf when worn around the neck and a balaclava or ET disguise when covering both head and neck.

Gloves

Very much a seasonal or environment-specific item, gloves are an item that I hate to have to wear. However, if you've ever had fingers that have become so cold that you've begun to lose manual dexterity, then you'll know that it's ultra-important to keep your hands in good working order. If you can't even grip a match between your numb digits, then your chances of survival start to drop rapidly. In my year-round kit I carry a pair of windproof fleece gloves with a grippy rubber dot pattern on the inside of the fingers and palm, which mean that I can retain some dexterity for certain tasks. I also have some lightweight fibre pile mittens with windproof Pertex® outers, which provide me with an extremely lightweight and warm extra layer for my hands. In extremely cold conditions you will need a slightly more robust glove for wearing all the time. Choose a pair with grippy leather palms, a breathable, waterproof lining and a removable thermal inner to speed up drying times. For winter mountain walking, it's wise to carry an easily accessible second pair for when your first pair become soaked, and a third emergency pair such as the lightweight mittens described earlier. Having three pairs isn't a luxury, more of a basic requirement in such cold conditions, because the continued use of your hands is so vitally important. All your winter gloves should have cord loops that can be fastened further up around your arms to prevent the wind snatching them away from you when you're eating your sandwiches.

FOOTWEAR

Unless you're particularly lazy, you'll spend a lot of time on your feet, so socks and boots choices are extremely important.

Socks

Yet again, natural fibres take the top spot here, and socks with a high wool content are the most comfortable choice for tramping about the great outdoors. A pair of thin liners with a slightly thicker second pair will help to prevent blisters when walking long distances. Look for models with extra padding on heels and toes; and for heavier winter boots some extra padding for the Achilles tendon area is a bonus. Carry at least one spare pair of socks in your pack and take the time to change and wash them regularly, because the fibres become compressed with use, becoming less springy and more likely to give you blisters. Washing and airing your socks will put a bit of life back into them.

Boots

Glance through any outdoor clothing catalogue and it seems that you need at least 15 different pairs of outdoor footwear to get you through the changing seasons. It's true that for extreme cold or icy mountain conditions you'll need a more insulated boot that can have a pair of crampons fitted to the sole, while in extremely hot conditions, lightweight breathable footwear will be more comfortable, but for most trips a simple leather walking boot with a fairly high leg will serve you well enough. The sole should have sufficient flexibility to be comfortable all day, and the boots need to be high enough in the leg to stop your average puddle coming in over the top, while giving support to your ankles when moving across unstable ground carrying weight. Padded ankle cuffs, speed lacing hooks, protective toe rands and waterproof, breathable linings are all good features if you've got a bit more cash to spend. Lightweight fabric boots with a waterproof lining are tempting if you like to feel light on your feet, but as a year-round boot I've found them to offer limited performance. Once the outer material is saturated, the breathable, waterproof lining stops working and your feet become very cold and clammy.

Fit is all-important, and you should always try new boots wearing the same sock combination you intend to wear when you are in the field. Make sure your toes aren't cramped and can wiggle freely. Watch out for any obvious rubbing and don't forget that most boots will stretch a little bit once you start wearing them in. (Don't count on that, though, as your feet will also swell up slightly when walking long distances or carrying heavy loads!)

In use, clean your boots at the end of the day by brushing the excess mud and dirt away (rather than leaving them caked in mud – don't forget, screw the nut), and feed the leather with boot wax to repel water. If they get a soaking, remove the insoles, pack with dry grass or newspaper and leave them to dry naturally. Never force-dry them near a heat source or the leather will crack.

For longer trips you may need to carry a spare pair of footwear. This depends entirely on your intended location, but could be anything from sandals to a pair of cross-country trainers. Neoprene aqua shoes are a good choice, being lightweight with a good grippy sole.

Finally, waterproof gaiters that fit over your boots are great in wet or snowy conditions. However, contrary to every picture you will see, wear your waterproof

trousers so that they overlap the gaiter rather than tucking them inside, otherwise rain will run down the inside of the gaiter and soak your feet.

A basic kit and how to pack it

The following list should be thought of as a core set of equipment to which you can add specialist gear for specific environments. Pack your core items using the same system for every trip – this will ensure that you know where everything is in poor visibility and should mean that you are less likely to forget something.

CHOOSING A RUCKSACK

First things first: you'll need some sort of carrying system. If you choose only one rucksack, go for something tough and simple that's a bit bigger than you think you will need. (Better to have a little bit more available space than having to strap on extra kit all over the outside. On my packing list I always note down as one of the essential items 'extra space'. You'll be amazed how much your equipment seems to expand during a trip.) You will need to tap into some of that previously referred to discipline when packing, and try to avoid filling the excess space with unnecessary ballast. A large rucksack can always be reduced in size by pulling all the tensioning straps tight.

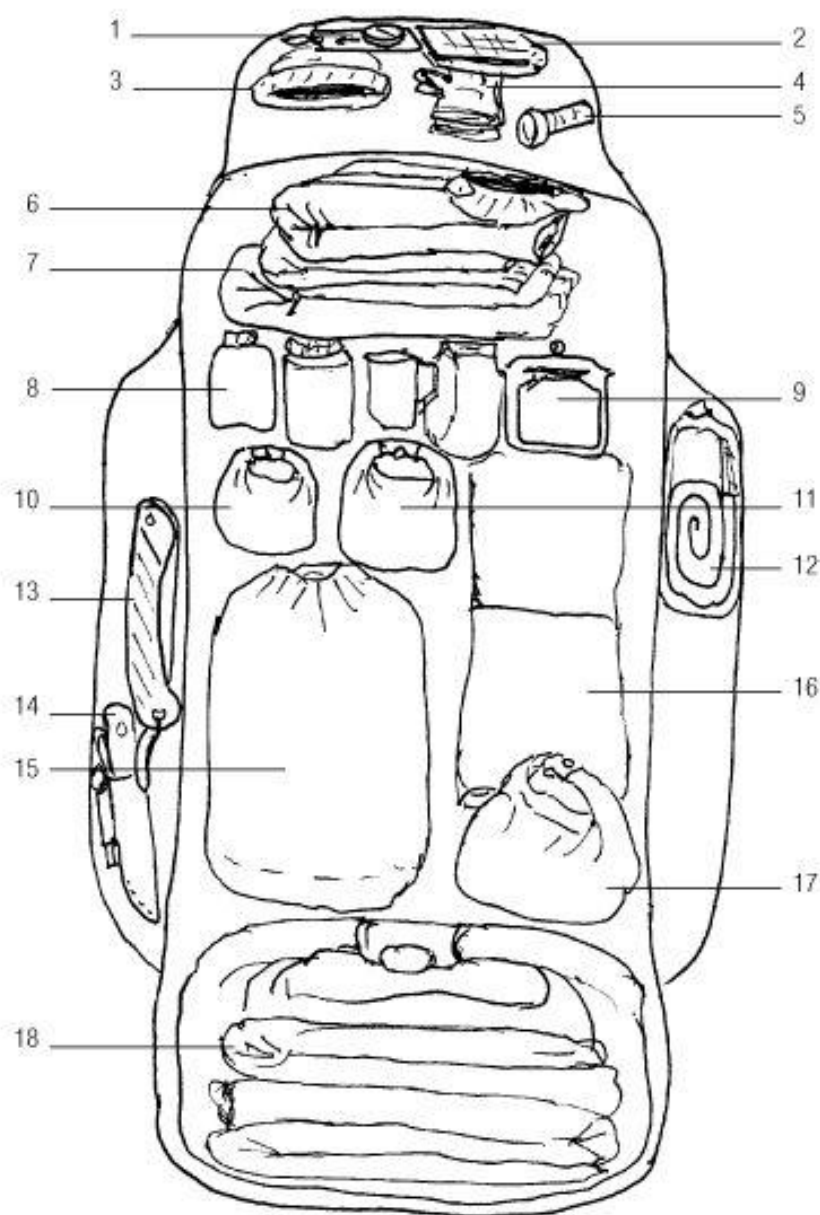
Internal frames, padded and contoured back pads and shoulder straps, chest straps and hip belts are pretty much standard on modern rucksacks now, even on army-surplus bags. All these features will help to make a load more comfortable to carry. A zipped pocket in the lid for small items of kit that you might want to get to without having to rummage through the main compartment is useful, as are removable side pockets. But be wary of too many 'extra features', which ultimately mean more stitching on the outside of the bag and more chance of leakage and breakage. I sometimes rub waxed cotton jacket wax into the lid of a rucksack, as this is the part that seems to get most soaked by rainfall.

1. A basic outdoor kit, laid out and ready to pack

your bag. Keep the weight distribution issue in mind while at the same time aiming to pack items in order of importance.

If not being worn, you'll need weatherproof layers at the top, just under the lid. Map, compass and torch should go in the lid pocket ready for use, along with a warm hat and gloves in cold weather. Cooking equipment, water, food and your bits and bobs bag form the next layer, along with a warm layer in winter conditions for whenever you stop for any length of time. Your sleeping equipment comes next, and underneath that will be spare and infrequently used items such as a wash kit and dry clothing. Any specialist equipment, such as cameras or GPS units, should be well protected in a padded, waterproof pouch. Don't forget to keep your mobile phone in a watertight bag too, and even if you have no intention of using it, charge it up fully before venturing off into the wilds; on longer trips, take a wind-up or solar charger.

2. How to pack your kit for ease of use and comfort



- 1 Compass
- 2 Map
- 3 Hat
- 4 Gloves
- 5 Torch
- 6 Waterproof clothing
- 7 Warm top
- 8 Water containers

- 9 Cookset and stove
- 10 Bits and bobs bag
- 11 Food bag
- 12 Tarp or tent (should be kept in a side pocket)
- 13, 14 Cutting tools (also better kept in a pocket)
- 15 Sleeping bag

- 16 Thermal sleep mat (could also be strapped to outside)
- 17 Wash kit
- 18 Spare clothing and kit

SURVIVAL KIT

Some travellers like to carry a survival kit comprising a number of items small enough to fit in a pocket-sized container. This is carried on your person wherever you go in the event that should you be plunged into an unexpected survival situation your mini kit will be close at hand and provide you with everything needed to stay alive until you can be rescued. I have what I feel is a realistic take on the traditional pocket survival kit in a tin. If you plan to travel through wild country, then you should already be suitably prepared with the equipment in your pack to survive if you get lost or injured. If you find yourself separated from your pack or suddenly plunged via a crashing plane or sinking boat into a harsh environment without warning, experience dictates that you'll be unlikely to be carrying your comprehensive pocket survival kit and will have to call on your training, knowledge and honed powers of improvisation.

Being prepared and surviving is largely a state of mind involving some forethought and planning. Evaluate your situation constantly and arrange your kit so that any items vital for survival are about your person if there seems to be potential for things to go wrong. Most importantly, get out there and practise your skills so that you know how to light a fire with no equipment, find shelter and water and signal for help. If you're visiting an unfamiliar environment or even just passing through, do some research before you go to help you transfer your well-practised skills easily to that locality.

What I do recommend is to have a few no-nonsense items attached to something that you are likely to have with you when everything goes pear shaped, such as your keys, or a sheath knife when away from civilization. A mini torch, firesteel, whistle and penknife are barely noticeable additions that could get you out of a pickle. On a plane, even these items will annoyingly have to be stowed with your main luggage, just the same as any pocket survival kit, meaning that improvisation, attitude and training will be more likely to save the day.

BITS AND BOBS

Also sometimes called 'possibles', these are all the smaller items you might need, some of which get an awful lot of use and some of which are kept for emergencies. I keep all these items in a small dry bag about the size of a 1kg/2lb bag of sugar and think of this as my only survival kit. If I have to remove my rucksack and there is potential that it could get lost, disappearing over the edge of a cliff or sinking to the bottom of a lake, I make sure my bits and bobs bag is on my person. This is plain commonsense and just requires some forethought. Likewise, if I want to go for a wander away from my fixed camp without carrying every single item of kit I own, then this 'bits and bobs' bag comes with me along with a full water bottle, a metal mug for cooking in and boiling water, a weatherproof layer and a cutting tool. I carry all this in a smaller daysack or shoulder bag within my main rucksack – this way it's permanently organized and ready to reach for. The contents are all useful and possible life-savers, but for every item in there you should have the knowledge to improvise an alternative.

The contents include:

Tinder bag Three methods of igniting a fire and dry tinder.

Torch A lightweight head torch is great for general use and also as a signalling device. Many are available with a flashing option for use as a distress beacon. For navigating and moving through mountain areas at night, I'll pack a torch with a stronger beam and halogen bulb. Don't forget to include at least two sets of spare batteries.

First-aid kit Plasters, padded blister plasters, antiseptic wipes, steri-strips, crepe bandage and safety pins, pain killers, a first field dressing, antiseptic cream and tweezers. This is a personal first-aid kit, so if you're leading a group you may need something more comprehensive.

Water-purification kit A purpose-made Millbank bag for filtering water, and some purification tablets for when you haven't got the time or means to boil water over a heat source. Keep the Millbank bag in a large clear plastic bag, which will stop it soaking everything else after use and can also be used for carrying and storing a large amount of water and as a transpiration bag.

Folding multi-tool .

Insect repellent Biting insects are not only a nuisance but also potential disease carriers. Keep the repellent well away from your compass in a little plastic bag, as it will make the transparent perspex cloud over.

Fine-mesh headnet For when the insects really become too much. This can also be used for catching fish, as a snow-melt bag and as a camouflage cover for your face.

Large, lightweight, orange plastic sack This serves as a marker for attracting attention from ground to air and also as an emergency waterproof shelter. I use a very lightweight version, which is more fragile than the traditional orange survival bags but packs down nice and small. This can be opened out flat for use as a highly visible waterproof shelter or filled with dry plant material to become a makeshift sleeping bag.

Compass A proper compass, a Silva type 4 rather than a tiny survival job, with navigational pacing beads fitted to the neck cord. Keep it in a padded pouch with a waterproof notepad, a short, stubby pencil and a non-metallic heliograph mirror for signalling using the sun. Heliograph mirrors are used by reflecting the sun intermittently at any potential search teams to look like bright flashes from a distance. Simply tilt your mirror until it catches the sun and aim the reflected spot of light in the rough direction of whomever you need to signal to. An easy way to aim the light spot accurately is to hold your hand at arm's length, obscuring the distant rescue team you need to signal to. Sight through the central hole and watch to make sure the reflected light spot falls onto your hand, then remove your hand to ensure that the bright spot is being aimed at the right place. (It's a lot easier to adjust your aim on a close object like your own hand than to try and pick it up on a hillside some distance away!) Tilting the mirror or replacing your hand hides the reflection again, and this process of revealing and hiding the reflection is what creates the highly visible flash. The reflective side of a CD makes a good emergency substitute. A note or two of caution: there is a slight risk of blinding the pilot who has been sent to look for you, and, should you be in an area of conflict, your bright flashes can look like gunfire to a fighter pilot!

Whistle Get the most powerful model you can find for attracting rescue in an emergency and keep it tied to your compass neck cord. Six loud, successive whistle blasts followed by a minute of silence (to listen for a reply) is the international distress signal. Keep blowing even after a reply is given to aid rescue teams in locating your position.

Repair kit A small piece of card holding a selection of different-sized needles and strong thread. Include a few big needles for using with natural alternatives such as sinew or plant fibres. Strong, adhesive tape, such as gaffer tape, is great for temporary repairs and other fixing jobs such as temporarily patching waterproof clothing.

Emergency ration A high-energy 'power bar' and a couple of sachets of hot chocolate might just be enough to boost your morale and top up your internal heating system to get you through the night. I gave up carrying chocolate a long time ago as it got eaten the first time I had to open my 'bits and bobs' bag on every trip. Everyone's got to have a weakness ...

Strong cord 10m/10yd of very strong but thin cord – useful for many emergencies from boot laces to animal traps.

Emergency fishing and trapping kit At least three brass-wire rabbit snares, a selection of different-sized hooks, some strong fishing line and some small lead weights, all kept in a small resealable plastic bag. These are to be used in emergencies when the need to find food in the wild becomes a reality. The brass wire and fishing line can also be used as part of a repairing kit.

FREQUENTLY USED KIT

These items are likely to be needed regularly throughout the day, so should be packed near the top of your rucksack just underneath your weatherproof clothing, which should be the first thing you see on lifting the lid. In cold weather, keep an insulating layer along with a hat and gloves here too, ready to put on whenever you start to cool down.

Cookset

You'll need at least one metal cooking pot, preferably two, one of them also serving as your mug. A good metal mug can do the job of cooking pot and mug on lightweight outings. Try to steer clear of aluminium, as it's pretty flimsy for bushcraft activities and I've even seen it melt on very hot fires. Stainless-steel, round-bottomed pots with bail handles are ideal. If you've got an understanding bank manager, then you could even consider titanium: strong and extremely lightweight but also incredibly expensive. Cast-iron pots and pans are bombproof and brilliant for using daily over the campfire, but they weigh a lot so are best kept for vehicle-based trips. Bail handles are perfect for hanging your pot over the fire and eliminate the need to carry separate metal 'pot grabbers', but if your pot hasn't got one then a length of flexible steel-wire cable can normally be fitted instead. With a bit of lateral thinking you'll be able to use the same steel-wire method with your metal mug to transform it into a billycan. All your cooking pots should have a lid to speed up cooking times, prevent too much liquid evaporating and keep inquisitive insects and unwanted debris out. To save space in your rucksack, look for pots that stack inside each other. To stop them clattering around, pack a tea towel between the two pots, which can also be used ... as a tea towel! Your cutlery need only be a spoon, as you'll have a sheath knife close to hand for any cutting. (If you feel panicky about the lack of a fork, then a neat little invention that combines both spoon and fork is available just for you – the spork!) Be neat, tidy and organized

and keep your cookset in a stuffsack to stop all your other kit getting covered in black soot.

Portable stove

Given the choice, I prefer to light a small fire for cooking, but sometimes this just isn't possible. If you intend to spend most of your outdoor adventures visiting places where having a campfire might not be permitted, or the terrain you are moving through has limited resources, then you'll need to pack a portable stove. These will generally be fuelled by gas from a canister or a liquid fuel of some sort. If you go for the screw-in gas canister type, make sure it takes a commonly available gas canister, also found in other countries if possible. For liquid-fuel models, go for something that can burn a variety of liquid fuels, such as petrol and kerosene, as well as the recommended fuel. This type of stove is a complicated little beast and prone to clogging, so make sure you have a cleaning, spares and maintenance kit to accompany it. Carry the fuel carefully in proper metal screw-top containers. Solid-fuel or gel-fuel stoves are very lightweight but slow to use and can't easily have the heat controlled.

An environmentally sound option is to make your own mini brazier, which will safely burn all sorts of locally found fuels – pine cones, dung, twigs and some dry bracket fungi. This can be something as simple as a stainless-steel cylindrical sink drainer or an old tin can with holes punched or drilled through the sides to allow a good supply of oxygen. The heat is concentrated in one place, speeding up cooking times and making the most of an otherwise poor source of fuel. The fire is kept small and contained, cannot spread and everything is easily burnt up to ashes, leaving no fire scar or half-burnt logs to tidy up afterwards.

Whichever stove method you decide on, always make sure that you also carry a windshield to conserve fuel usage and keep the heat where you want it to be – under your cooking pan! The best material for this is a section of thin, flexible aluminium sheet that will stand up on its own to make a cylindrical tube that surrounds both stove and part of the pan, take being folded and unfolded and reflect heat back onto the cooking pot via its reflective surface. Disposable foil roasting trays are a cheap but practical option. However, a word of warning: with any stove that has an integral fuel tank under the burner, this windshield must not be so close as to cause the fuel tank to get hot, as this could be extremely dangerous. With these stoves your windshield must only be a barrier from the wind and should allow adequate ventilation by not forming a complete cylinder. A safer option here would be to use logs or rocks to make a mini windbreak so that the canister underneath can stay cool.

Water holders

A container of water is a vital part of your kit, but carrying enough to meet your daily needs can be a weighty business. If you like to travel light, you might replace some of your equipment with lightweight alternatives and take only the bare essentials, but water will, annoyingly, always weigh the same: about 1kg/2 ¼lb for every 1 litre/1 ¾ pints. I carry two strong plastic 1-litre/1¾-pint containers plus an empty, flexible, 10-litre/17 ½-pint bag and a method of filtering and purifying more water from a natural source on the move. In the wintertime, one of these containers is replaced with a small stainless-steel thermos flask. The 10-litre/17 ½-pint bag is handy for storing a

good quantity of water prior to setting up camp, if your campsite hasn't got a source nearby. For more information on water carrying, storing, sterilization methods and equipment, see chapter 5.

Food bag

It's good practice to carry all your food supplies in a sturdy dry bag, not so much because of the soggy-biscuit dilemma but more to do with the risk of hungry animals being tempted into your camp. Even if you are in a part of the world that has a zero chance of large predators, there are still plenty of small ones to burgle your supplies in the night. My main rucksack has several repairs where greedy rodents have nibbled a little doorway through the tough material. Go for a good dry bag with an airtight closure to keep all those delicious smells locked inside, and attach a long length of strong cord to hoist it up over a high branch out of reach of potential four-legged food thieves.

LESS-FREQUENTLY USED KIT

These items are normally needed only once a day, so should be placed near the bottom of your pack.

Wash kit

Washing shouldn't be viewed as a luxury when you're living out of doors. Keep yourself in tip-top condition by keeping all your nooks and crannies clean on a daily basis. I carry a minimalist wash kit if going away for anything longer than a day. A bar of non-perfumed soap, toothbrush and paste, anti-bacterial talc and a lightweight towel all squeeze into a small dry bag about the size of a tin of beans. Keep your soap in a little net bag: you can then hang it on a branch and use it through the mesh without having to take it out. Anti-bacterial talc is great for rubbing into soggy feet at the end of the day, and you will need a lightweight camping towel. Don't forget a roll of toilet paper. Squash it flat and keep it in a resealable plastic bag. My advice is to keep this separate from your wash kit and in a rucksack pocket easily reached in the event of a 'toilet emergency'.

Sleeping bag

Similar in construction to duvet jackets, sleeping bags generally come in a choice of either down feather or synthetic fillings. As with the jackets, you will find that a good down-filled bag should squash down smaller, last longer and weigh less than its synthetic equivalent, but the synthetic version will do a better job in damp weather.

All sleeping bags are graded depending on the conditions they're designed to cope with. This will often be '1 season' (very warm summer temperatures), '2 season' (slightly cooler summer temperatures), '3 season' (good for all but the coldest depths of winter), '4 season' (winter conditions) and '5 season' or 'expedition rated' (extremely cold conditions). You might also have the highest and lowest suggested temperature range supplied, but a good rule of thumb is to take the lowest temperature given with a pinch of salt, as manufacturers have been known to

exaggerate sometimes. You should always check to see what the lowest night-time temperatures are for the area you intend to travel through before deciding on which sleeping bag to buy.

Make sure your bag has enough room if you happen to be bulkier or taller than average and that it has a drawcord-tightened hood that can be pulled up tight around the face for cold nights. Sleeping bags can become damp in use, even just from moisture in the air, which will mean a colder night's sleep for you. So, if you intend to sleep in a natural shelter or under a lightweight tarp, you might want to consider a waterproof and breathable sleeping-bag cover, or 'bivi bag'. These can be stupidly expensive if you go for a big name. By contrast, ex-army bivi bags are cheap, roomy and made to take a bit of abuse, so are a good investment. A good tip is to keep your sleeping bag inside your bivi bag when packing your kit. This means that your precious bedding is always kept inside its waterproof cover, ready for action. For packing, squeeze any air out through the neck opening and ram it down as far as it'll go to fill all those little spaces and voids in the depths of your rucksack. Even with your bag protected from the elements, it can still become slightly damp during the night due to perspiration, so take it out of its waterproof cover, hang it over a branch or line and give it a good airing daily.

Sleeping mat

Your sleeping mat is one piece of kit that can realistically be strapped to the outside of, or tucked under the hood of, your pack. In lightweight, frameless rucksack designs they can also be folded and slid down inside the pack just behind the strap fixings to provide more padding against your back. This is a vital piece of equipment and must not be overlooked if you value your sleep. The filling of your sleeping bag will compress underneath you and not offer much in the way of insulation from the cold ground, so always carry both bag and mat. Self-inflating thermal mats are the best for keeping you toasty warm but can become punctured on thorns or rocky ground, so invest in a small repair kit. High-density foam mats that can be folded or rolled are certainly more reliable but not as comfortable and a bit bulkier to pack. If you're looking to save weight and space, then you might consider carrying a three-quarter-size or even half-size mat, which provides warmth for your core only. A flattened rucksack can make up the missing portion under your feet and legs, though this isn't really an ideal long-term choice. If you intend to make your own bed using locally found materials, then the smaller mat is a good addition and always there if you haven't got the resources available for a natural bed.

Tent and shelter system

There is a multitude of different designs to choose from. For really cold conditions, teepee-style tents are available with little flat-pack wood-burning stoves, and for hot environments all-round netting for protection from creepy crawlies should be high on the list of considerations. For open, mountainous areas you'll want something double-skinned and lightweight, but robust, with a low profile and a good porch area for cooking in (never use a gas stove inside a closed tent). Sewn-in groundsheets make a lot of sense, too. With no end of extra features and palatial designs available, remember that you've got to carry the thing, but also bear in mind that a two-person

tent can be split between two people. For most environments I carry a lightweight tarp rigged up with guy lines as a shelter. This combination is extremely versatile and with a bit of imagination can be rigged up in all sorts of useful configurations. Even if the enclosed comfort of a tent is necessary on certain trips, I'll try to squeeze in a lightweight tarp to create a covered area outside the tent.

Emergency/Spare kit

Even for day trips, you should always carry some items of spare clothing in case of a thorough soaking followed by an unexpected overnight stay in the wilds. A thermal long-sleeved top and long johns, spare socks, a wool headover (hat and scarf combined), your spare gloves and a lightweight Pertex® windproof hooded top and trousers make an extremely lightweight set-up that can be squeezed into a small, waterproof bag and forgotten about until you need it. For cold weather add a fleece-, synthetic- or down-insulated top. For extra smugness, include a high-energy power bar, a small candle, some dry tinder and tub of waterproof matches, and while you're tucking them away, imagine how relieved you'll be if that disastrous day ever comes when you need to break them out again.

If you intend to be out for only a day, then you won't want to be dragging a sleeping bag and tent everywhere. An insulated survival bag that folds down to the size of a video cassette, plus a lightweight shelter (such as a 'bothy bag'), won't take up much room or weigh you down and will save your bacon if you are visiting an environment where natural shelter and firewood prove difficult to come by.

CHAPTER 2

BUSHCRAFT TOOLS

Choosing and using the tools of the wilderness

One part of the backwoodsman's equipment that has yet to be mentioned (but is really so important that it deserves a chapter of its own) is a cutting tool. A sharp tool of some sort should always form the foundations of any outdoor kit list. Not to be perceived as just an extra gadget to weigh you down, your cutting edge should be viewed as the one piece of equipment that can be used to carve, slice and chop almost everything you need for survival from the natural resources surrounding you.

KNIVES

A strong, well-designed knife can be easily carried and kept handy for both small cutting jobs and more heavy-duty tasks when required.

Multi-tools and Swiss army knives

While not really designed for long-term or serious use, a folding multi-tool or Swiss army knife is great for inclusion in a survival kit or as a back-up tool in case you lose or break your main cutting edge. I always carry one in my 'bits and bobs' bag. They also have a number of other useful features, such as pliers, various screwdriver tips and scissors, which can be handy for repairing your flashy, modern equipment. However, folding blades are not the strongest of tools, and should you find yourself using your multi-tool or penknife to perform heavy-duty tasks, be prepared for its lifespan to be severely shortened. As an occasionally used piece of kit, it will need to be well maintained by having its moving parts and blade edges oiled before storage for any length of time.

Sheath knives

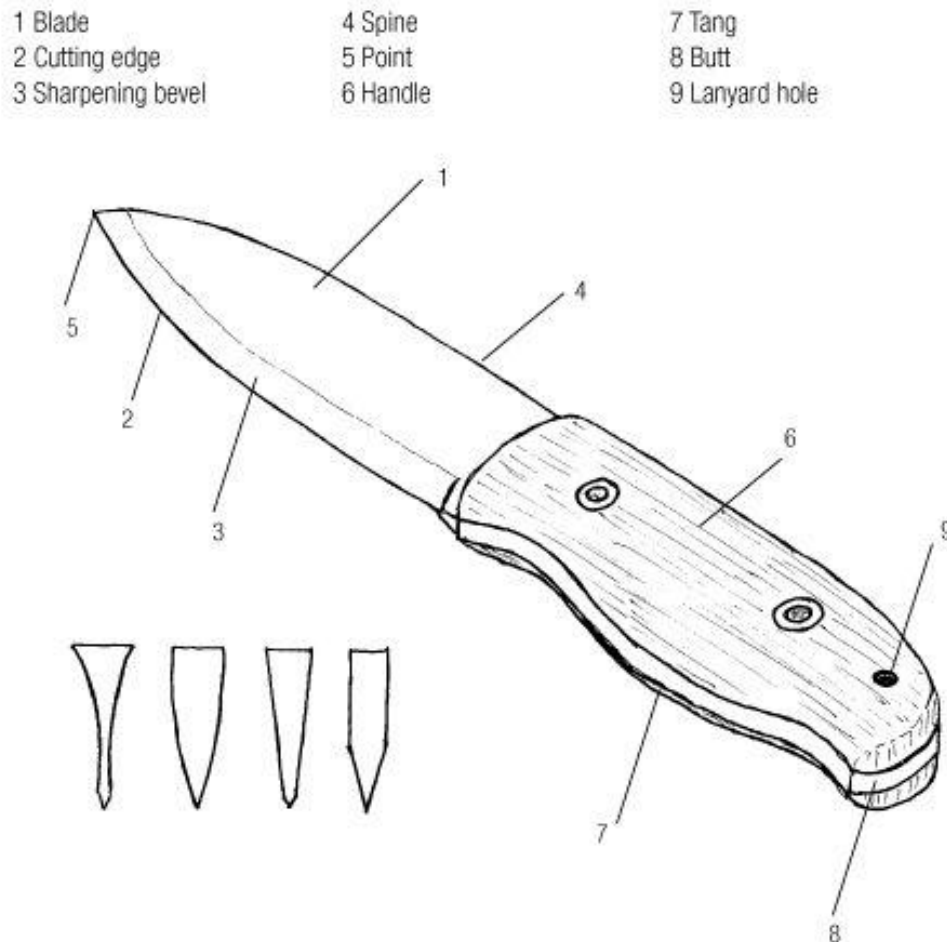
You don't have to spend much time living outdoors to realize the importance of a good knife. When working with natural materials, you will find it in almost constant use – splitting firewood, cutting green wood, preparing food, carving, whittling, gathering shelter-building and thatching materials, collecting certain resources such as bark or plant fibres ... the list is almost endless. While certain sharp tools are better suited to specific tasks than others, a strong, general-purpose knife is capable of carrying out an extremely wide range of jobs in the right hands. Combined with a sound knowledge base and a certain amount of adaptability, a knife can be used to provide all your survival needs. This versatility makes it easily the most important piece of survival equipment you can carry.

CHOOSING A KNIFE

For a knife that can turn its hand to any task, avoid gimmicks and gadgets, such as certain parts of the blade having saw teeth, or a knife with a hollow handle containing a mini survival kit. Avoid double-edged blades, too, unless you're intending to take down sentries. The back of the blade (the spine) should be squared off to accommodate the use of a wooden batten for heavy-duty work (see woodcarving projects, page 66). A slightly sharp corner along each side of the spine is handy for removing the green outer bark from a sapling or for striking down a firesteel to give a good shower of sparks. However, if you intend to do a lot of whittling using your thumb to provide control on the spine of the blade, then sharpened edges will absolutely wreck the pad of your thumb. For this reason, habitual whittlers sometimes carry an additional smaller blade for fine work that has a nice rounded-off spine.

3. Sheath knife and blade profiles

A well-made, full-tang, Scandinavian-grind sheath knife. Also shown are a selection of alternative knife-blade profiles, from left to right: hollow grind; convex grind; flat grind with secondary bevel; Scandinavian grind.



Grinds and bevels

Blade type and length are largely down to personal preference, but on the whole a drop-point blade with a flat grind will be the most useful shape for general use. A drop-point blade is one where the spine sweeps down to meet the cutting edge, and the

cutting edge sweeps up to meet the spine, resulting in a pointed tip somewhere around the centre of the blade's width. The grind refers to how the blade thickness is ground down to produce a cutting edge. This can be done in a number of ways, depending on the intended use for the knife. A hollow grind is slightly concave and normally used on hunting and skinning knives, whereas a flat grind means that the bevel is just that, flat, making a stronger edge for more heavy-duty tasks.

A flat grind normally consists of a primary and a secondary bevel. The primary bevel refers to the gradual thinning down of the blade's thickness, which could start anywhere along its width, depending on the type of flat grind. A slightly steeper-angled secondary bevel, or sharpening bevel, takes over as the blade narrows about 2mm/1/2in from the cutting edge. This arrangement gives the blade a thin profile for cutting well, with a strong, sharp edge provided by the secondary bevel. It's also quick to sharpen, as less metal needs to be removed. However, with such a tiny portion of the blade to sharpen, it's not easy to get the correct angle by eye out in the field.

A variation on the flat grind is the Scandinavian flat grind (also known as the Scandi grind): a continuous angle starting around 8–10mm/3/4in up the blade and meeting at the cutting edge at an angle of around 25–30 degrees. Developed for blades likely to be used for woodcarving, this makes an extremely sharp and strong general-purpose edge on thicker blades, and it's easy to check that you're maintaining the correct angle when sharpening in the field. For really heavy jobs, such as splitting hardwood, take care with the Scandi grind, as it is prone to becoming chipped. If you're more of a chopper than a carver, look for something with a secondary bevel or an axe-like slightly convex grind (although it is hard to keep the correct sharpening angles in the field).

Size

The best dimensions for a general-purpose knife blade are 25mm/1in wide and 100–125mm/4–5in long. Anything bigger can make finer work difficult. A thicker blade may mean a stronger knife, but it can also feel heavy and clumsy, so aim for around 3–4mm/1/4in spine thickness. Knives with more modest blades are easier to pack and lighter to carry, meaning you're more likely to have one when you need it. Get used to working with one and develop your carving skills, as smaller blades used properly can achieve a surprising amount.

Blade size and temper

The hardening process that steel goes through is known as temper, and this is measured in units known as Rockwells. The higher the number, the harder the blade, but if too high, although it will hold a good edge, the blade becomes extremely brittle. Aim for something up in the high 50s.

Blade material

This is generally a choice between stainless steel and a high carbon steel. Carbon steel can discolour and rust if left unused in damp surroundings, but this won't be a problem if you remember to clean and dry the knife after use, even oiling it with an edible oil if you know it's not going to be used for a while. Stainless steel, by

comparison, is more corrosion resistant than carbon but can be a bit harder to sharpen if laziness has got the better of you and the edge of your knife has dulled. Once you have a sharp edge, though, it will normally last longer than the edge on a carbon blade. Despite their benefits of resistance to rust and edge retention, stainless-steel blades can feel a bit 'soulless' in comparison to a carbon-steel blade, which, when you hold it in your hand, looks and feels like a professional tool crying out to be let loose on the first whittling stick it encounters.

Tangs

The part of a knife blade that is hidden within the handle is known as the tang, and this can take a number of forms. First, a stick tang involves a dramatic narrowing of the blade inside the handle to become a thin steel rod. Sometimes this will be threaded to take a brass nut clamping the blade tightly into the handle. A more traditional method is to leave the steel slightly softer where it emerges from the butt end of the handle, to be hammered over so that it fixes the blade in place.

A partial tang, or hidden tang, does not extend the full length of the handle but is firmly fixed using strong adhesive or a brass pin through both handle and tang. (Both of these methods are fine for smaller, less heavy-duty knives, but when subjected to any lateral force, the strength of the knife is largely dependent on the solidity of materials used in making the handle.) Lastly, a full tang is where the blade and handle are made from the same thickness of steel, making the knife one complete unit. The full shape of the handle is cut from the steel, and the thickness required to make the handle comfortable to hold comes from fitting shaped slabs of wood or similar material on either side of the steel with strong adhesive and metal pins drilled through both handle and steel tang. This is the strongest way of making a knife, and if the handle slabs break, your knife is still usable and repairable in the field. A handle should be made to fit the hand, but some handles appear to have been created in the hope that the hand will contort to fit its unusual 'Hollywood'- style shape. You won't enjoy carving anything with a knife like that.

SHEATHS

Fixed-blade knives will come with a sheath for storing and carrying. The quality of the sheath can often give a good indication as to the quality of the knife. Look for a solid, well-made design. Check the part where the blade slides in and out of the sheath to see if there is potential to slice the stitching, or yourself. The knife should sit inside snugly. Good-quality leather sheaths are wet moulded around the knife handle to make an almost vacuum-like seal. Even when shaken upside down, the knife stays safely inside.

A little integral pocket or sleeve for holding a fire-lighting tool or mini sharpening stone is handy to have included. Sheaths can have a small hole to attach a cord for wearing around your neck (only recommended for use with small whittling or skinning knives unless you want to end up with a stoop) or for slinging around your body to hang against your ribs like an undercover cop's gun holster. Most sheaths have a tunnel loop integral to the sheath for wearing it on your belt. Go for the belt-loop option and attach a piece of cord to the loop in case you ever want to sling it.

The knife is such an important tool to the survivor that you should get in the habit of periodically checking that it's still in the sheath and hasn't been lost during any sudden and inexplicable urges to do cartwheels.

Carrying a knife

Remember that not everyone views a knife as a tool, so while you're on your travels keep it packed safely away in your rucksack and out of sight. It should certainly never be worn or taken out in a public place unless you want personal experience of how quickly the armed response units deploy. In fact, outside of a genuine survival situation, you should always ensure you have a good reason in the eyes of the law for carrying one in a public place. It's such a shame that the actions over the years of an uneducated minority has made the carrying of such a useful, everyday tool into a crime, with the knife itself viewed as the evil villain responsible for its moronic handler's wrong doings.

Using a knife safely

Slicing yourself or someone else accidentally when medical help is a long way off is not to be recommended, so whenever you pick up your knife to use it, run through these mental checks:

- If you carry any kind of sharp cutting tool, a good first-aid kit must be carried with it. This must be capable of handling large and small cuts until you can receive proper medical attention.
- Keep the knife safely sheathed when not in use or whenever you move around. Walking even a short distance in the woods with an unsheathed blade could lead to a nasty accident if you were to trip or slip. Be aware of how you hold the sheath as you withdraw the knife. Ensure that your hand is well below the sheath opening to avoid sliced digits.
- Any knife use should take place only after you have secured a safe zone all around you. Reach out to full extension with your arm and spin around 360 degrees. If there is another person within that safe zone, move away (or ask them to).
- All cuts must be planned and controlled from start to finish. Always cut away from any part of yourself and think about the follow-through constantly. Where is that blade going after you have successfully sliced through the stick? I've seen people using their own leg as a sort of workbench before now – not a good idea.
- With any cut, particularly power cuts (pointing the end of a stick), always do it to one side (the outside) of your legs, NEVER in the space between your legs. If you were accidentally to cut the femoral artery running up the inside of your thigh, you would be in serious trouble, probably dead!
- With that sobering thought in mind, when sitting down to whittle, get in the habit of keeping your elbows on your knees. This ensures that you work safely away from your vulnerable inner-thigh area.

- Never jab your knife into a log or the ground while working. If your hand is wet from rain or sweat, it could easily slip past the handle onto the blade. Also, a knife stuck in a log has the majority of its blade exposed for any unsuspecting soul to brush against. As for a knife buried in the ground, this is bound to hit a rock or stone, blunting the sharp edge. A blunt knife is a dangerous tool, needing more force behind it when cutting, creating far more potential for a serious accident if you slip.
- Never throw your knife or use it to dig around in the ground. Use it to fashion a digging stick from hard wood instead.
- Your knife is a multi-use tool: you could be cutting wooden tent pegs with it one minute and slicing vegetables the next. Clean the blade properly before sliding it back into its sheath, especially after preparing wild game and meat.

CHOPPING TOOLS

A heavy chopping blade offers an advantage in any woodland or forested environment, but does carry with it a weight penalty and an increased safety risk. Any sharp tool can be dangerous in the wrong hands, but where a knife might slice through trousers, an axe or machete will happily chop through the end of a thick, leather boot and into your little piggies contained within. However, used carefully and responsibly it will make light work of any heavy splitting jobs, improve your carving speed by efficiently removing waste wood faster, fell trees and open up a whole new world of wood-based construction projects that cannot realistically be undertaken with a small blade. In some densely forested parts of the world, a large, heavy blade is seen as the primary survival tool, being used for chopping, slashing, felling, splitting and even fine carving and butchery in the hands of a skilled operator. Generally speaking, longer, slashing-type blades such as machetes will be most suited to jungle environments while the trusty axe is found hard at work in many guises all over the world's woodlands. Large-bladed survival knives often fall somewhere in between the two, but I've never found them anywhere near as effective as an axe, or even a hatchet of a similar weight, and are far more blister inducing and tiring to use.

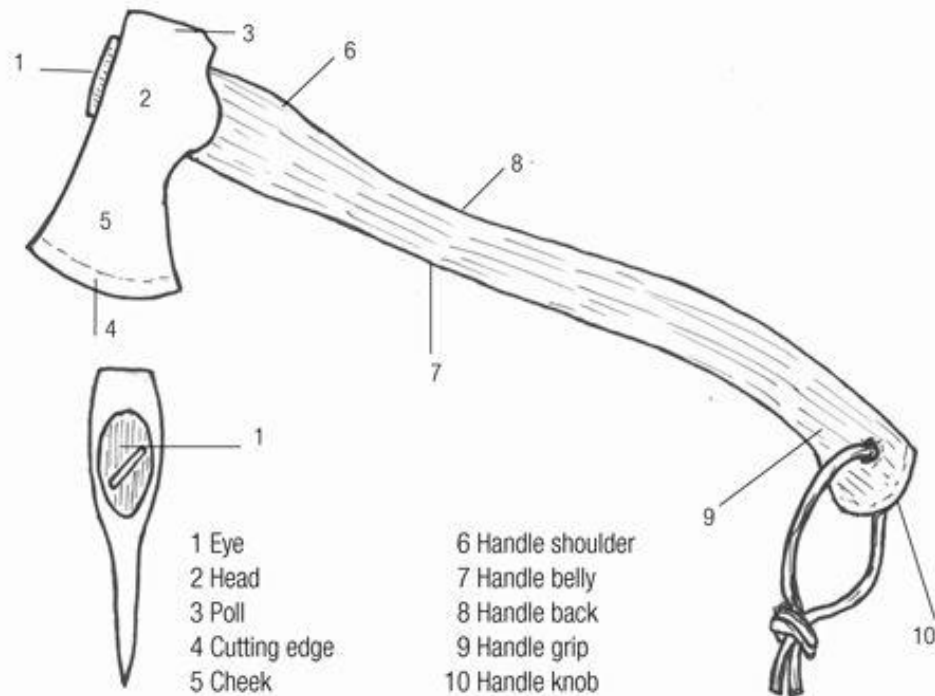
Axes

When hunting for a suitable axe, you will find heads and handles of all shapes and sizes designed to perform a multitude of different jobs. For general backcountry use, choose a head weighing around 750g/1lb 10oz, with a curved cutting edge of around 9cm/3 ½in. The grind should be slightly convex to give it strength. As with your knife, this should not be tempered too brittle, as it will chip. Similarly, it should be kept almost shave sharp, as a sharp axe does what you expect it to do, whereas a dull axe will bounce off in a dangerous fashion. It's also far more energy efficient to use a sharp axe in the long term, so regular honing is definitely recommended.

The handle should be made from a straight-grained wood that takes shock well, such as ash or hickory, and should be 4.5–6.5cm/1 ¾–2 ½in in length, carved into a flattened oval in line with the blade and shaped ergonomically so as to be comfortable in use. Integral fibreglass handles can sometimes be found on axes, but a wooden

handle has the advantage of being repairable in the field. Handle and head combined will add 1–1.5kg/2lb 4oz–3lb 5oz to your pack, so think carefully about where you're going and consider its usefulness against its extra weight. A smaller hatchet-style axe is a tempting lightweight option but won't perform as many tasks as a slightly larger one. Of course, many jobs undertaken with a metal axe can still be achieved by primitive methods – they just take longer and require more energy and patience.

4. Typical bushcraft-axe design



Note the convex blade grind, which provides a strong cutting edge for heavy work.

Using an axe safely

- Even more so than with a knife, think twice, cut once. In other words, plan every cut before committing to it. Think about your follow-through and where the axe will end up if you miss altogether. You don't get many chances with axe-related mistakes – normally only one.
- Clear your 360-degree safety zone completely. No one must be standing idly close by while you're swinging an axe, certainly no nearer than your arm's length plus the length of the axe handle.
- Before using, check the axe to make sure that the head is still tightly fixed and hasn't become loose. A loose head may be due to a change in environment bringing about some shrinkage in the handle. Soaking the handle in water is a temporary solution.
- Clear any obstructions or distractions that could foul your swing. That includes dangling possessions, flapping clothing, buzzing insects and chatting friends.
- Don't chop into the ground – use a log as a chopping block or backstop.

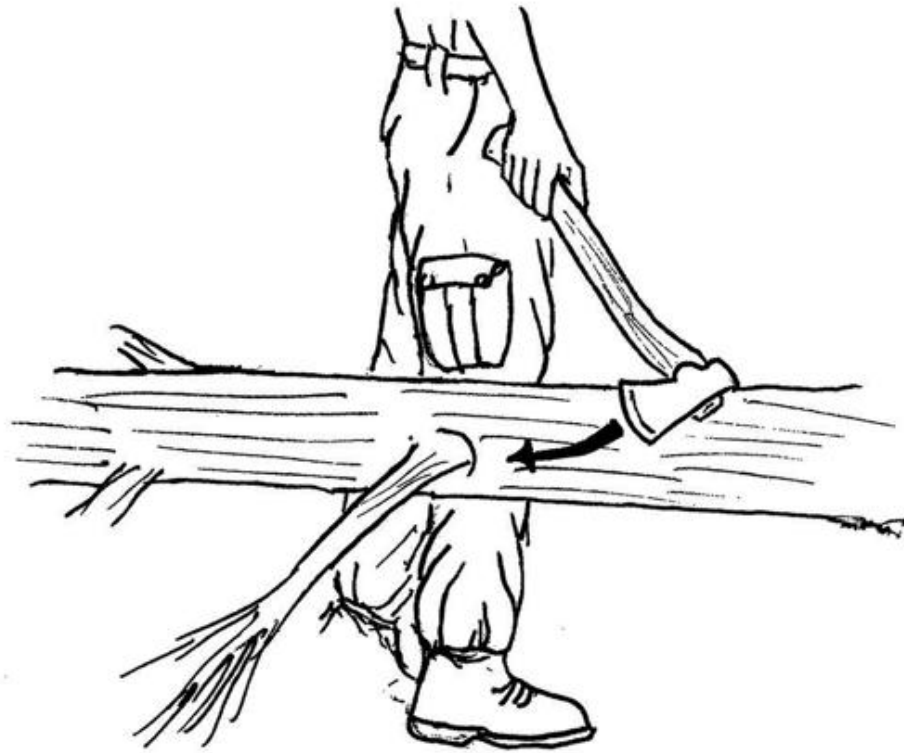
- Don't use an axe in poor light, such as at dusk. For starters, a heavy chopping blade should never be used in low-light conditions. Chances are you will also be tired, making this a prime time for accidents. Use the saw instead.
- If you have to stop using your axe for a brief period, drive it into a stump rather than laying it on the floor to be trodden on. As soon as you finish using it, place it back in its protective sheath.
- When moving short distances with an unmasked axe, grip it around the shoulder just below the axe head, blade facing away from you. Hold it away from your body and be prepared to throw it to one side if you trip and fall. Having said that, your best bet is to slip the protective sheath back on before you even start to move.
- Never hit the poll or butt of the axe head with anything other than a wooden hammer, as the metal around the eye will distort or crack, making it dangerous to chop with.
- Keep the axe head clean in between jobs and oil it in the same way as you would your knife blade when it goes into storage.

5. Safe axe use 1

When using an axe to split sawn logs, use a level stump or similar wooden surface to chop onto and place the log at the furthest away part of the chopping stump, in case you miss.

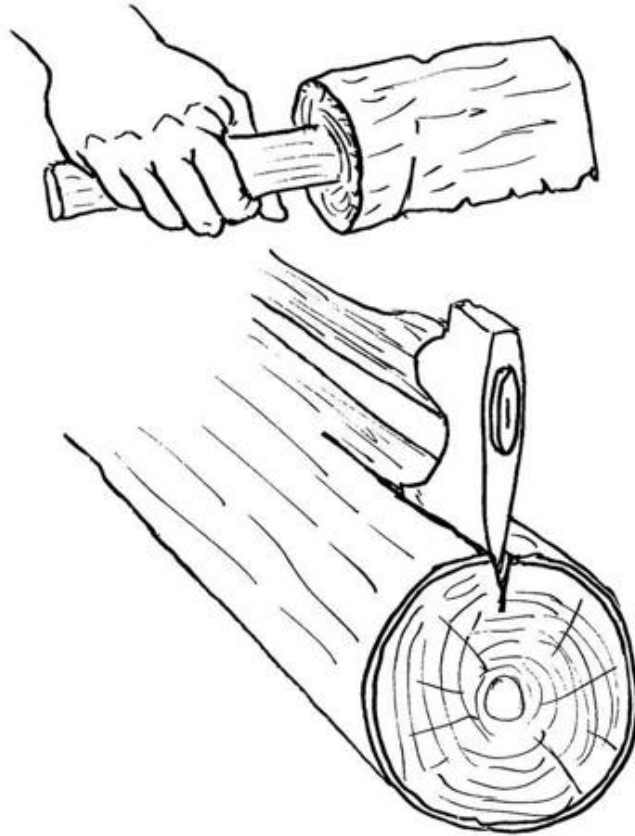


When chopping branches from a fallen or felled tree, always chop on the far side of the tree. This ensures the trunk is kept between your leg and the blade as an extra safeguard. Note that branches are best removed in the direction in which they grow.

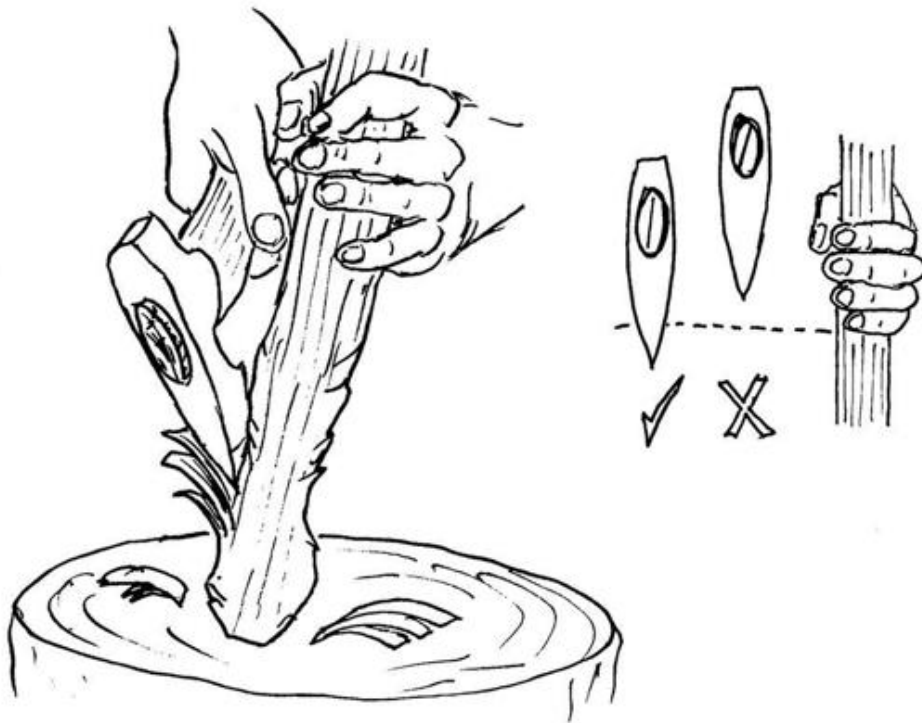


6. Safe axe use 2

When splitting large logs, you can hit the axe poll with a wooden hammer, but never a metal one.

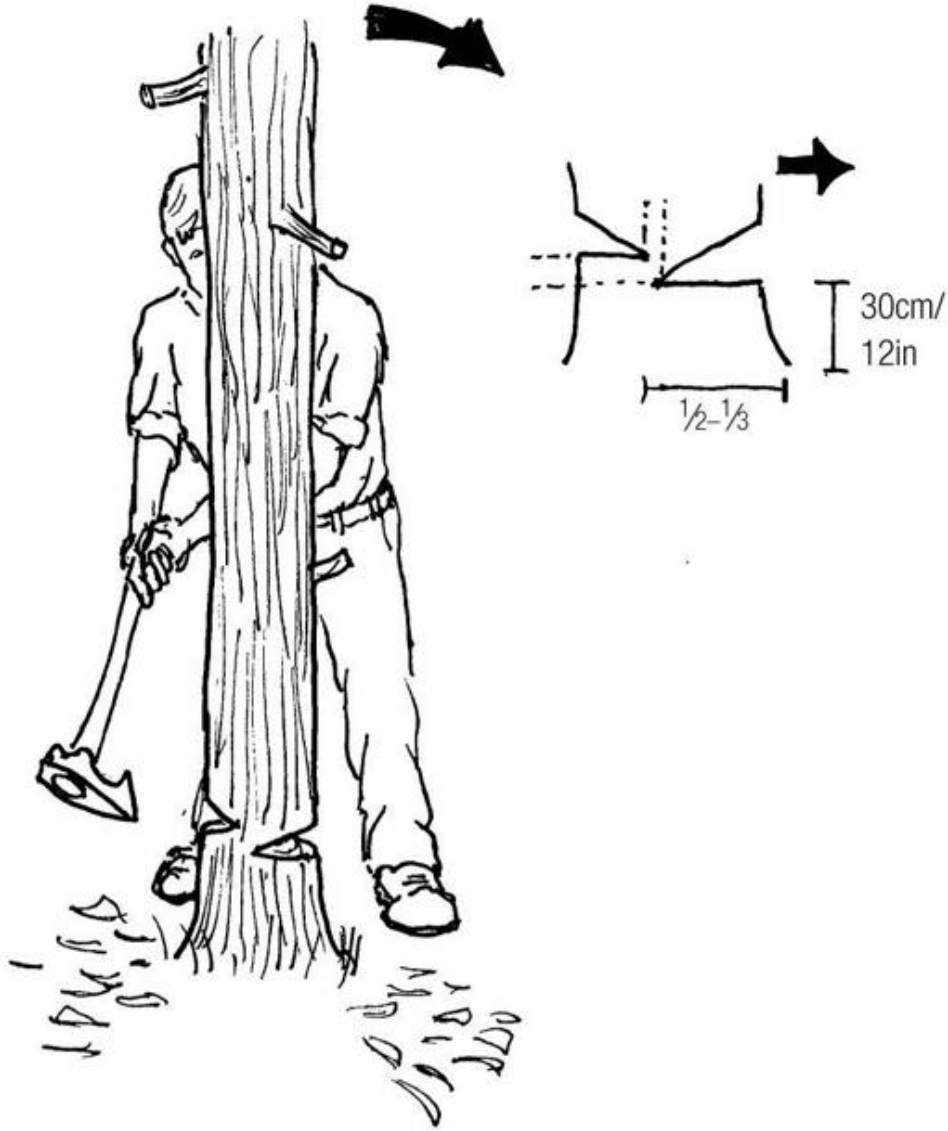


For shaping and carving cuts using the axe, chop onto a solid wooden surface and never bring the cutting edge of the axe up higher than your supporting hand.



When felling with an axe, first make an undercut on the side you wish to drop the tree (usually the direction in which it leans or the side with heavier growth) no more than 30cm/12in above the ground and between a third and halfway through the trunk. Your second cut (the back cut) must be slightly higher on the opposite side to provide a backstop for the falling tree to push against as it falls.

No backstop could mean the tree won't fall where you want it to or might kick back dangerously. Be aware of dead, precarious branches overhead as you chop and be well out of the way when it starts to fall.



When chopping a log into sections, always cut at a slight angle to make a 'V' notch and chop opposing sides until they meet in the middle. Always consider where the axe will end up if you miss, and keep your legs well out of the way.



SAWS

For the woodland craftsman travelling light or the low-impact camper, a wood saw makes the perfect complement to a sharp-bladed tool. This could be a folding pruning saw or a larger bow saw, or even both on longer, more demanding trips. A good saw blade will perform nice clean cuts, which is a lot kinder to the tree when harvesting green wood than using an axe. It will increase the size of materials you can realistically work with and help to make your work more precise – brilliant for backcountry carpentry.

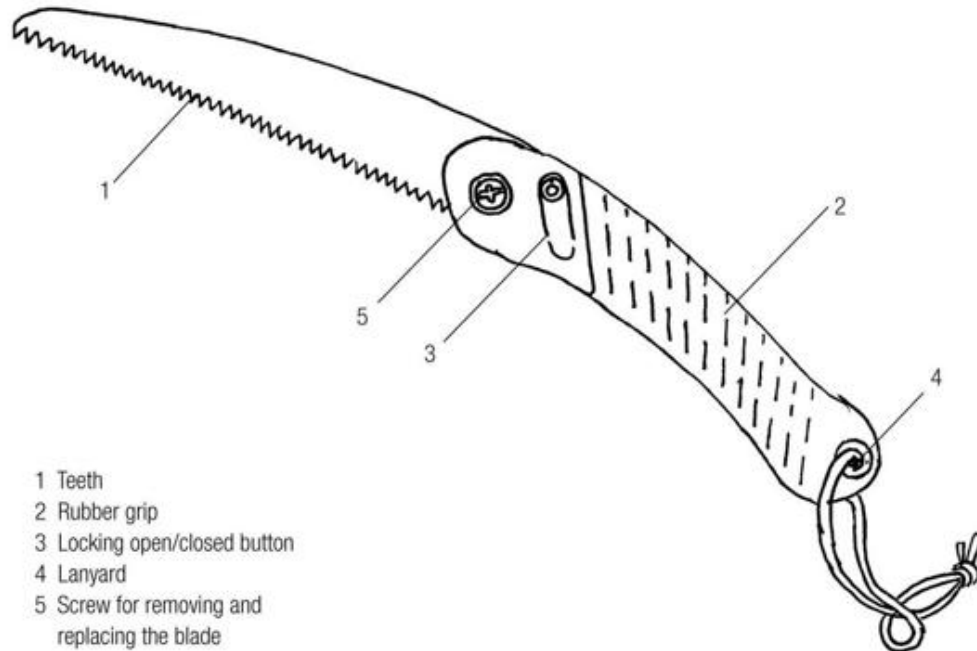
Pocket saws

Survival-type wire saws are only really intended for emergency situations and have a very limited lifespan, so should not be considered as a serious tool. They are best used with a partner in tandem or fitted to an improvised frame of some sort. Being designed to pack down tiny means that they aren't very substantial and frequently overheat in use, often snapping. The pocket chainsaw versions are slightly better but still not really designed for regular use.

In the case of the folding pruning-type saw, the size of materials you can work with is governed by the length of the blade, ranging from a pocket-sized 125mm/5in right up to an insane 500mm/20in. On trying one for the first time, you will be amazed at how such a lightweight and easily carried tool can make cutting jobs so much easier. Don't let the plastic-looking handle fool you: the blades have sharp, aggressive teeth that cut on the push and pull stroke, making them ultra-efficient. They can also really slice into a digit given the chance, just like a little piranha! The teeth can't normally be sharpened due to the hardening process they go through to keep them sharper for longer, but blunt or broken blades can easily be changed for lovely new sharp ones.

Packing a couple of spare blades on longer trips is definitely recommended. Surround them with cardboard bound with gaffer tape for safe carriage.

8. A good design for a general-purpose folding pocket saw



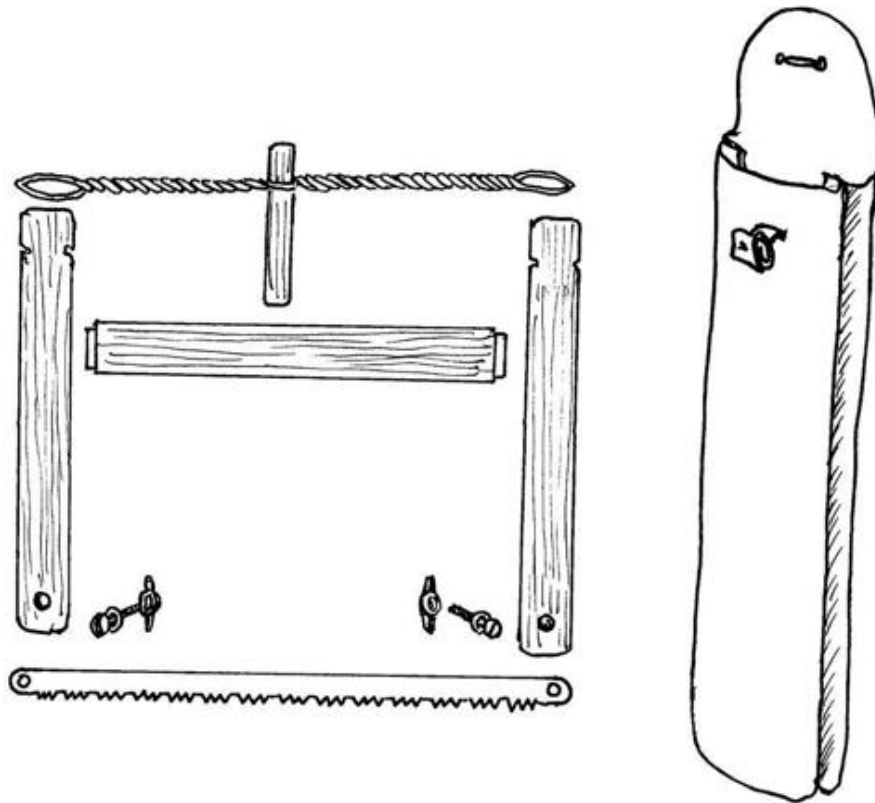
Bow saws

A larger saw will obviously be able to cope with larger jobs, so it's worth taking one for long trips based around a fixed camp in the woods. A good bow saw, also known as a bucksaw, will chomp through some impressively thick timber to provide you with large-diameter sections for your backcountry carpentry, Yule-type logs for an overnight fire, a solid structure for a semi-permanent shelter and forearms like Popeye, to boot. If you think a large orange Sandvic bow saw would be a nuisance to pack, you can make a traditional collapsible version yourself quite easily using a bow-saw blade, a couple of bolts, some strong cord and a solid, homemade hardwood frame.

These frames can even be improvised in the field using locally found wood.

9. A homemade wooden bucksaw frame

Made to hold a steel saw blade with easy-to-remove wingnuts. The horizontal wooden bar must be jointed into the side sections of the frame at a height that will allow large logs to be cut. The frame is tensioned by winding the cord at the top. Always fit a blade cover when packing the saw or when it is not in use.



Using a saw safely

With any saw, large or pocket sized, plan every cut just as you would when using a knife or axe. Don't attempt to hold the wood you wish to saw in your hands or brace it with any part of your body. Instead, use a saw bench-like surface to cut onto, or to one side of – a fallen tree, large log or tree stump is ideal. Hold the wood securely by standing or kneeling on part of it, with the section you wish to cut overhanging the saw bench.

Alternatively, find a sturdy tree trunk splitting off into two to form a V shape and slide the pole about to be sawn behind one trunk but in front of the other. Pulling it towards you with one hand secures it in place to be cut.

10. Clamp the wood you wish to saw with your boot against a stump.



11. Wedge larger log sections in the handy crotch of a tree to hold them steady as you saw.

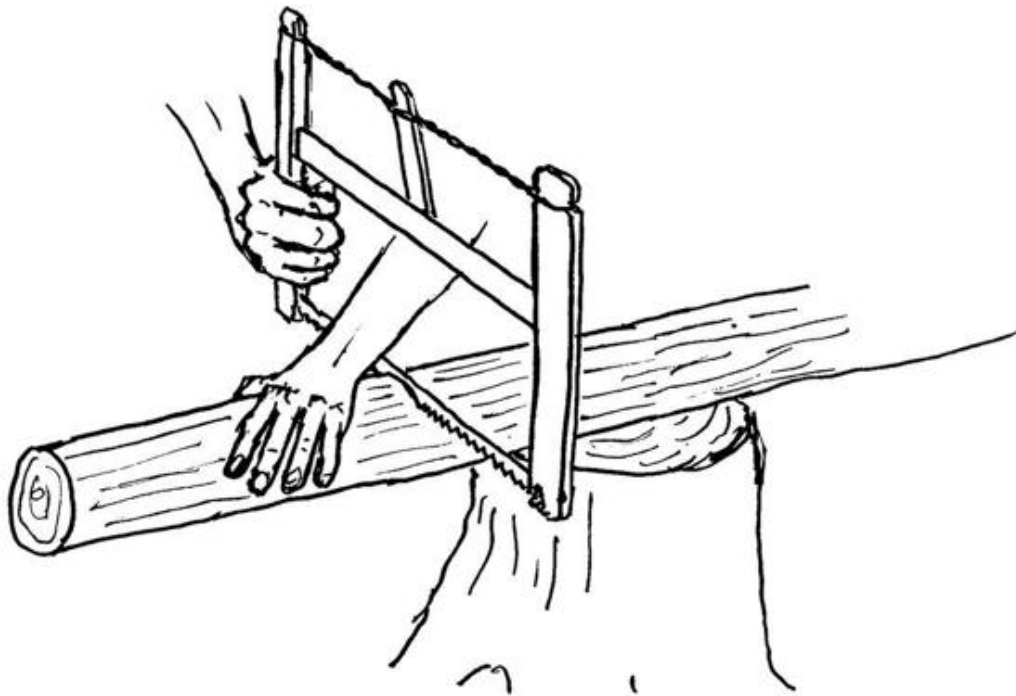


Now that the wood is securely placed, you are ready to start sawing. Position yourself so that you will saw to one side of your legs, not in between the two. Rest the

blade on the wood and draw the blade towards you a couple of times to start the cut off. Don't be tempted to hold the wood near the initial cut, as blades with such coarse teeth tend to skip around unpredictably before 'biting' in. (With bow saws, place one hand through the frame, above the blade, to grip the wood. This ensures that a jumping blade will touch your holding hand with only the top of the blade, where there are no teeth.) As you saw, the section overhanging the saw bench will drop slightly to open up the cut, making sawing easier.

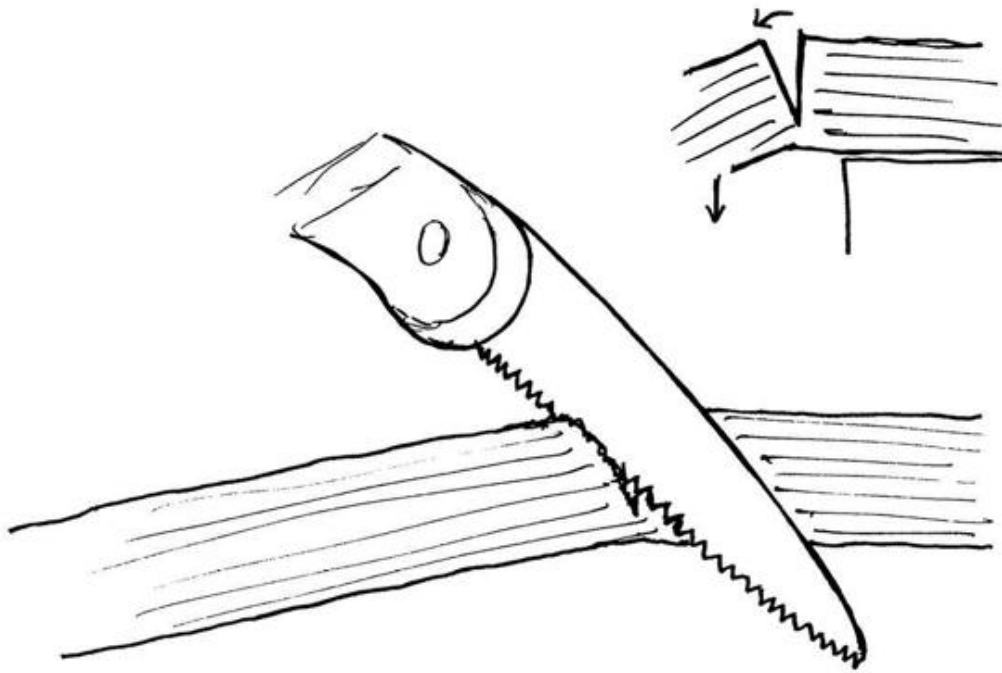
Plan your follow-through and slow your cutting strokes just before the blade emerges from the underside of the wood. This way you can retain some control and avoid those sharp teeth flailing around wildly as they burst forth into who knows where. If the blade jams as you cut, stop and think about why. A small wedge hammered into the cut above the buried blade can help to prize both surfaces apart, or you might just need someone bearing down on one end of the log to pull the cut open so that it doesn't pinch the blade.

12. Placing your supporting hand through the bucksaw, above the blade, will prevent a bad cut to your fingers



13. Stopping the saw blade from binding

Let the sawn wood overhang the cutting block to allow the cut to fall open. This will prevent the blade of the saw from binding.



ADDITIONAL WOODCARVING TOOLS

Crooked, hook and spoon knives are not essential items in terms of immediate survival but are certainly very useful crafting tools for a wilderness-living lifestyle. Basically consisting of a shaped wooden handle and narrow curved blade, they were traditionally used to carve anything from canoe components and paddles to wooden utensils, cups, bowls and trugs. The shapes and sizes of these types of knife vary greatly and depend on the country of origin: Native American-influenced designs normally curve only slightly at the end, while Scandinavian designs tend to have much more of a hooked curve for hollowing. I always pack one of these knives, as they weigh very little and mine always gets used, especially during those long winter evenings around the campfire. Weirdly, these tools never seem to come with a protective sheath, so for use outside of the workshop you will need to employ your crafting skills and get to work on a leather, wood or bark cover.

SHARPENING BUSHCRAFT TOOLS

I can remember as a 13-year-old fledgling survivalist being frustrated with the knife I used at the time. I could cut and carve with it, but any job seemed to require more energy than I thought it should. I took my knife home, clamped it up in my Dad's Black & Decker® Workmate and set to work with a coarse file. Luckily it was only a cheap knife! Amazingly, though, this did make a positive difference to its cutting ability, and before long I had grasped the clear advantages of keeping a blade sharp, progressing onto finer stones for a keener edge. However, it wasn't until completing my training as a carpenter that I began to appreciate fully just how important a sharp edge is to the

craftsman. A regularly honed blade is far safer and easier to use. Trying to force a blunt edge through the tough fibres of a piece of wood can only lead to wasted energy, sore hands and aching limbs, not to mention splintered, fuzzy carving as rough as a badger's haunches. Also, due to the excessive force required to manhandle a dull blade, the chances of you ending up with a serious cut are multiplied many times. Keep your cutting tools sharp, primed and ready for action, and take pleasure in doing so, as this is the mark of a serious craftsman.

Sharpening stones and a portable kit

Sharpening stones are graded in 'grits': the lower the number, the coarser the stone, and the coarser the stone, the more metal you grind away. To take your blade from blunt to razor sharp, you will need a coarse stone of around 800 grit, a medium stone of around 1200 grit and a fine stone of 6000 grit. Conveniently, Japanese water stones can be bought as a combination stone with a medium side and a fine side. On the basis that a coarse stone will hardly ever be needed if you look after your blade, this medium/fine combo should do the job nicely. Another benefit to the Japanese stone is that, while it comes in the same skinny house-brick size as most other stones, you can (just about) saw it with a metal hacksaw blade to make a smaller, more portable version.

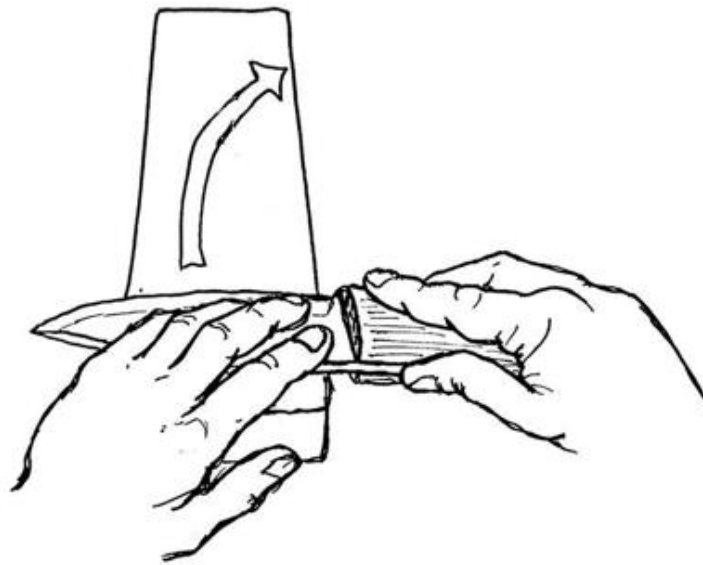
Keep your cut-down combination stone sealed in a small airtight plastic box, and carry it in a little pouch with some fine wet and dry paper, a small length of 12mm/½in copper tubing and a mini coarse diamond file (not as expensive as it sounds). Use the fine wet and dry paper wrapped around the copper tubing to gently remove sharpening burrs from the inside of any curved hook tools, and the mini coarse diamond file to work on any damaged or unbelievably blunt sections of your axe or knife. The wet and dry paper can also be used to re-flatten the fine side of the combination stone, which is soft and easily scored or worn unevenly. Your leather belt can double up as a strop, but if you don't wear a belt and your trousers seem to stay up magically of their own accord, then a small length of leather can also be included in the kit for stropping. A small section of grippy rubber matting to sit the stone on, holding it in place, is a useful addition to this small but comprehensive sharpening kit.

Sharpening a knife

Before using your stone, soak it in clean water. Water acts as a lubricant, helping the metal blade to move easily across the stone's surface. It also flushes away any metal particles from the porous stone and creates an abrasive paste to assist with the job. This highlights the main advantage of water stones over oil stones: the lubricant is readily available and more ecologically sound. If you keep a close eye on the sharpness of your knife, you may need to use only the fine stone to hone the edge, but every so often you should take it back to the medium grit.

14. Sharpening a knife

Press the sharpening bevel to the stone and apply even pressure to all parts of the knife blade, pushing away from you in a curve to sharpen the whole edge in one movement.



Turn over and repeat on the opposite side, applying equal pressure and for the same number of strokes. Take great care if bringing the blade back towards you.



Lay your blade flat on the stone facing away from you. Tip the spine up until your sharpening bevel is pressed flat to the stone's surface. With true Scandinavian grinds, this will be the whole bevel; with secondary bevels, it will be just the very edge of the blade. With even pressure on all parts of the blade in contact with the stone, push the cutting edge away from you in a slight arc, ensuring the whole of the cutting edge bites into the stone with each stroke. Try hard to maintain the same angle throughout the movement, and tip the blade as you come to the end of the stone to allow for the curve at the tip of the blade. Beware of rotating the cutting edge too far as if actually cutting into the stone, as this will blunt it further. Carry out the same movement around ten times, then swap sides and hands and perform a mirror image of your previous actions for another ten strokes. Now both sides of the blade should have had equal treatment. Study the blade close up and you should see your efforts reflected in the

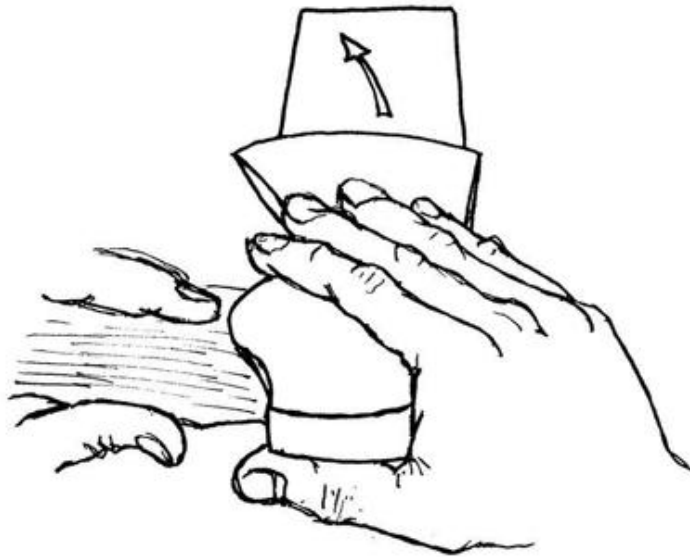
light, giving you an indication of how you might need to adjust your angle, if at all. Repeat the procedure, alternating ten times on each side, constantly checking to make sure your angles are correct. If you have been using the fine stone, your knife should now be ready to strop. If you've been beavering away on the medium stone, carry out exactly the same routine with the fine stone, stopping every now and again to sprinkle the stone's surface with water for added lubrication, before stropping.

Sharpening an axe

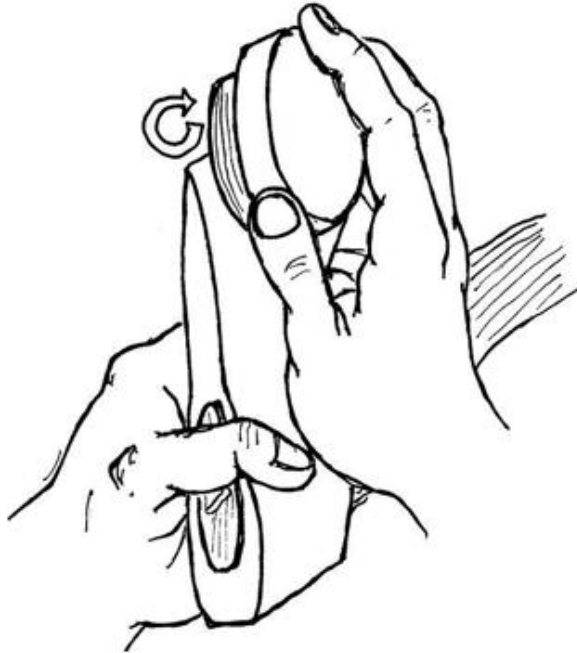
Axe blades can be sharpened in exactly the same way as a knife or can have the stone rotated against the blade as the axe is held firm. Axes take a bit more abuse than knives, so the diamond file may need to be used to start the process. Wear thick leather gloves for this, or just be very, very careful. Don't forget to continue honing the blade further in than you would with your knife, changing the angle as you go to follow any existing convex grind. The angle of the face should blend naturally into the cutting bevel with no obvious 'shoulder' to impede your chopping progress.

15. Sharpening an axe

Sharpen your axe blade as you would your knife when using larger stones.



With cut-down stones, hold the axe securely and rub the stone against the blade in a circular motion.



Stropping

By now your knife or axe blade will look shinier and feel sharper, but the gradual grinding away of metal particles from each face of the blade will have left an almost microscopic ribbon of steel clinging to the cutting edge. If left alone, this will break away the first time you use the tool, leaving a ragged edge, which will soon become blunt. Polish this tiny burr away by laying the blade on your smooth leather strop, facing away from you as before, but pull the blade towards you this time, maintaining the same sharpening angles as you used previously on the stones. Turn the blade over and push it back across the strop to take care of the other face. Alternate with each stroke, but be careful not to drag the tip of the blade across the strop as you rotate it, as this will round off your precious sharp edge. Fifty strokes back and forth should give your blade a mirror finish capable of shaving hair or slicing a sheet of paper like a razor.

16. Stropping

Drag the sharpened blade over a smooth leather surface to remove any burrs and polish the edge to a razor sharpness.



USEFUL WOODCARVING PROJECTS

If you're going to carry woodworking tools, you should know how to use them. Here are a few useful projects that will cover most of the basic woodcarving techniques you will need to use your tools efficiently. Carving and whittling next to a campfire is a great way to spend an evening, but don't forget that safety to yourself and those around you must be your priority at all times. Always think twice, cut once!

Digging stick

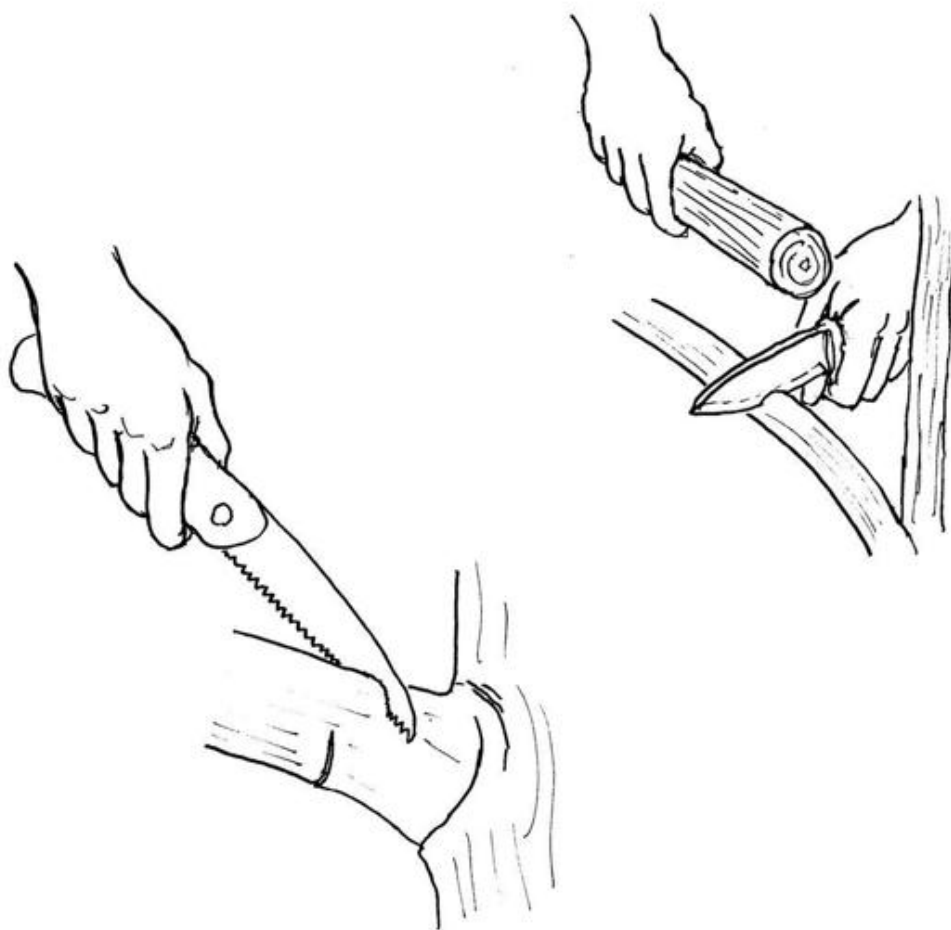
A digging stick will get regular use, especially when you are looking for seasonal wild food. A long one can also double as a walking staff, while a short one can become your throwing stick.

First choose a suitable length of sapling around 2.5–5cm (1–2in) in diameter. If cutting from a coppiced stump, angle the cut so that rainwater will drain away from the centre. If cutting green wood from a main trunk, always leave the branch collar intact

to aid re-growth and repair. If the branch is quite a heavy one and some distance from ground level, make a small cut on the underside first to ensure that when the branch falls it doesn't peel off a long strip of trunk bark with it, which could lead to the tree becoming infected. Always look up before you cut a sapling in case the upper branches are caught around any precarious dead wood overhead. A saw will leave a nice neat cut, but if you haven't got one, a knife can be used like a chisel, with a wooden batten acting as a mallet. Bend the sapling slightly so that the wood fibres you're cutting through are under increased tension, making the cutting easier.

17. Cutting a digging stick

Right: When using a knife blade to slice through a sapling, you will find it much easier if the wood fibres are under tension. Using a wooden batten on the back of the blade can effectively turn your knife into a hatchet.

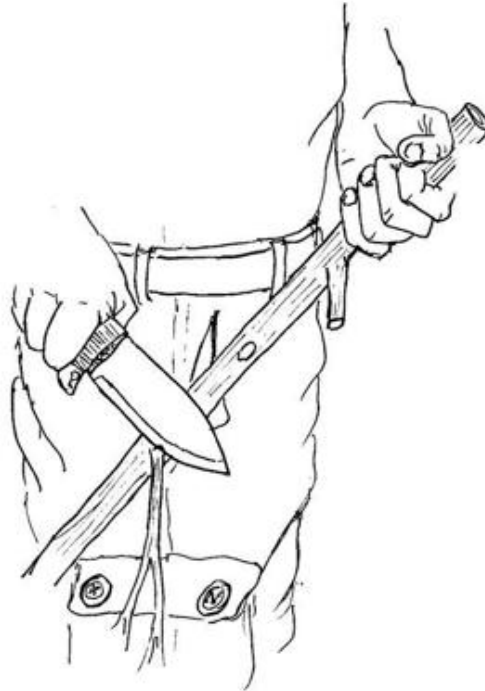


Left: This is the kindest way to remove a green limb from a tree. Undercut first and leave the collar intact.

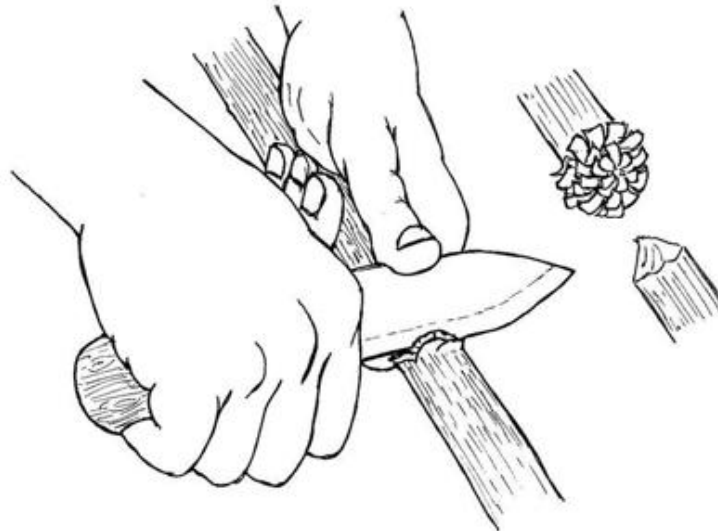
After checking that there's no one in your immediate area to get accidentally cut, hold the sapling to one side of you, with the top branches facing away from you, and trim each branch with a forceful and deliberate slicing cut. Think carefully about your follow-through and where the knife blade will end up once you have completed the cut. Always cut on the furthest side so that you have the timber between the blade and your leg in case of a slip. (If your sapling has a useful branch sprouting out at an angle from a thick section of it, forming a 'tick' shape, keep this a bit longer and keep it in mind for use as a pot hanger, amongst other things; see illustration 18.

18. Trimming and sharpening

Trim branches in the direction in which they grow. Slice through forcefully, but consider your follow-through and safety area to avoid injury.



A rosette cut is one way of cutting wood into sections by carving around the circumference until the wood is sufficiently weakened.

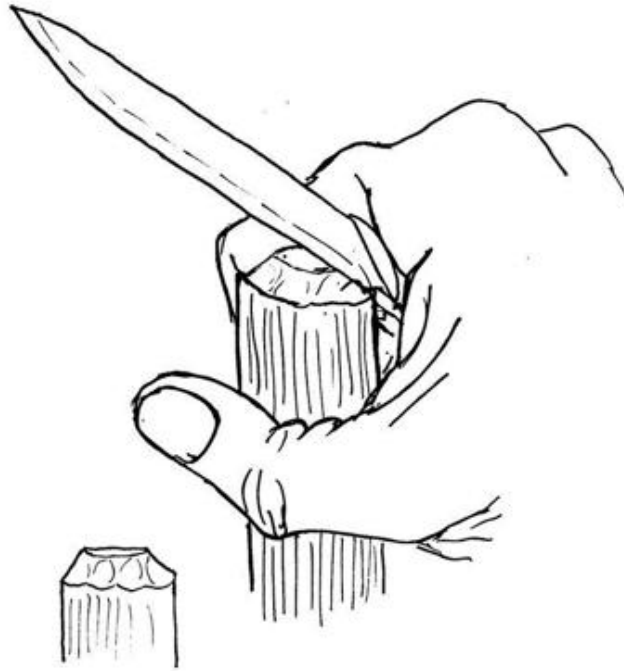


Using your thumb to apply more pressure to the back of the blade (as shown on page 68), make little slicing cuts into the wood all around the circumference just below the pot-hanger section. Always think of a piece of wood as a bundle of individual fibres rather than a solid object and aim to cut through a few fibres at a time instead of all of them in one go. By making these smaller cuts deeper and deeper into the wood as you work round its circumference, eventually you'll cut all the way through even quite large diameters. This technique is commonly known as a rosette cut because the cut face resembles the petals of a rose. Trim these 'petals' away to leave a tidy carved edge. Carving a softer angle all around the end of a wooden staff or stake is

known as bevelling or 'rounding off', and it makes the wood much more comfortable to hold and use as well as providing some 'reinforcement' around the top to lessen the chances of the wood splitting when being pounded into the ground. Use a controlled slicing cut and deliberately aim your cuts to miss the pad of your thumb once the wood has been removed.

19. Bevelling and pointing

Bevelling the cut face of a stick will tidy it up and strengthen the edges. Be careful not to slice your thumb.



Right: For pointing thick sections with a knife, use a wooden batten like a mallet to remove more wood.



Rest the other end of your digging stick on a sturdy chopping stump or fallen tree. Using your knife and a heavy batten like a chisel and mallet, cut into the stick end at an angle of around 45 degrees. Turn the stick over and repeat the same thing on the

opposite side to leave you with a chisel point on the end. Performing two more cuts in will turn the chisel point into a sharp, stabbing point. Note the use of a solid-wood surface to chop onto rather than the stony ground (where your blade could get chipped) or into thin air (where you have no purchase at all). Heat the wooden point in the fire before use to harden it.

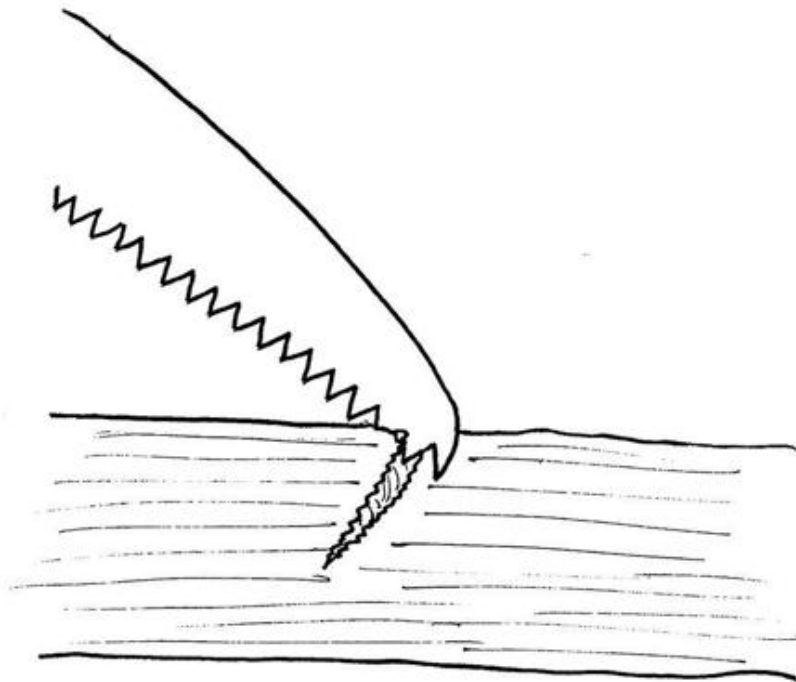
Pot hanger

The 'tick'-shaped length of wood you have kept to one side is the perfect shape for a number of camp tasks. If you sharpen a point on the opposite end, you have a readymade peg for securing down a guy line or for incorporating into a trap. Alternatively, by adding some evenly spaced notches along its length, you've got yourself an adjustable billycan hanger to use over the fire or to hang your pots on tidily when not in use.

To make a notch in the wood, first you need to make a 'stop cut'. This is basically a pre-emptive cut at roughly 90 degrees to the grain of the wood (the direction it grows in). In the case of the notch, you want quite a deep cut, reaching almost halfway through the wood. This provides a substantial gap in the wood fibres, so that when you start to cut in the direction of the grain you'll stand far less chance of slicing further down than you intended. Understanding how beneficial a stop cut can be in woodcraft is a big step towards being able to carve across the grain effectively and not just along it.

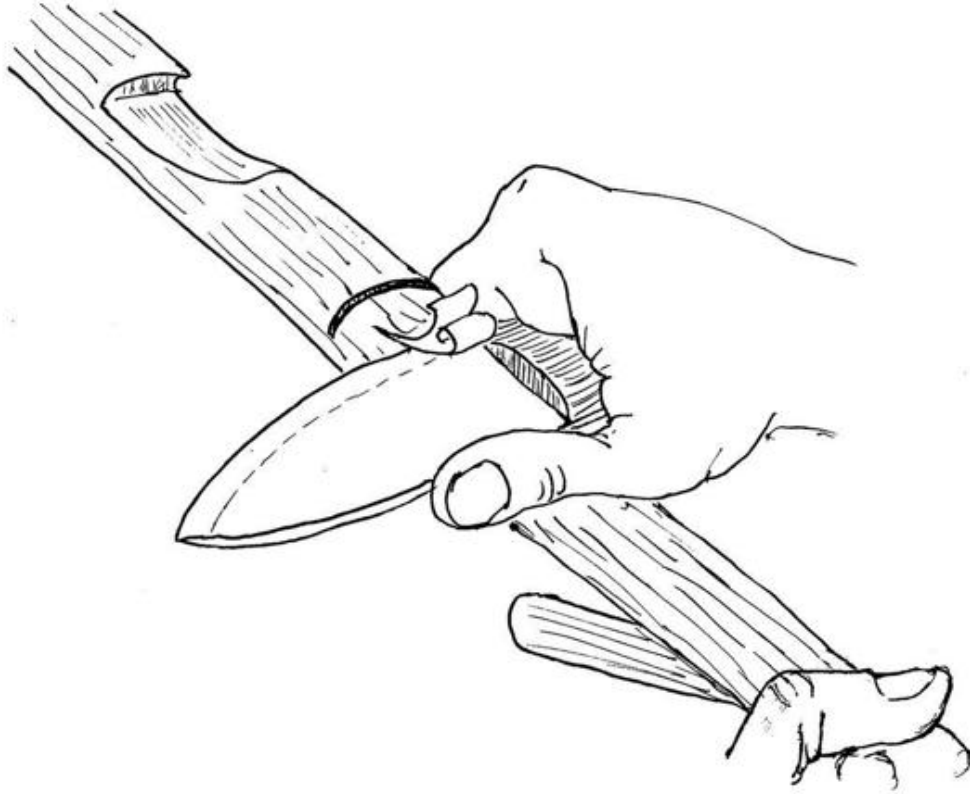
20. Stop cut

A saw cut at right angles to the grain is a pre-emptive carving technique. In this case, the saw cut angles back slightly to create a 'hook' once the waste is removed.



21. Carving out the waste towards the stop cut

Carefully carve away shavings to create and deepen the hook.



Hold up your pot hanger to confirm which way up your notches need to be, then, carefully supporting one end of the stick, begin to carve out the sloping part of the notch. Remember to concentrate on removing only fine shavings and aim to reduce the downward pressure as you near the stop cut just in case you skip over the cut and slice away a whole section that you didn't intend to. Get used to the feel of the knife working on the wood, as these controlled, fine slicing cuts are what you need to perfect when carving feather sticks for the fire. Perfecting your notch cuts will help you greatly in carving trap components.

IMPROVISING TOOLS

Of course, you can't always guarantee that you'll have a knife, axe or any other form of sharp cutting tool with you, so it's a good idea to become familiar with some of the natural materials that were used before metal blades became commonplace.

Making a flint tool

Glassy rocks, such as flint, chert and obsidian, provided a wide range of simple and sophisticated tools for mankind for millions of years, making our new-fangled metal versions seem like a recent fad! Some incredible precision flint tools that have been recovered from archaeological sites provide us with a brief peek through the curtains at the incredible amount of skill needed to break and flake a stone correctly in order to create tools of the strength and sharpness that a razor could only dream of.

Luckily, you don't need the skills of a Stone Age master craftsman to produce a sharp, usable cutting edge that can be used for shaping wood or butchering game. Wearing strong gloves and eye protection of some sort, and using extreme care to avoid injuring yourself or someone else (flinty stones can shatter into extremely sharp shards like glass), drop a weighty flint nodule onto another rock with some force to crack it open. Inside the cortex (outer layer) the dark, glassy structure will be clear to see. Secure the flint on the ground, and with a heavy, smooth rock (such as quartzite or granite), about the size of a large potato, aim a sharp downward blow at the top corner of the exposed flint face in order to break a sharp flint flake away from the core. To remove a decent-sized piece, the direction of this blow must mirror the same angle of the flint face you're aiming to remove a flake from, and should strike about 5mm/1/4in in from the edge of the face.

Once you've got your flake, use a piece of sandstone to blunt any sharp edges you wish to hold, or wrap them in rawhide.

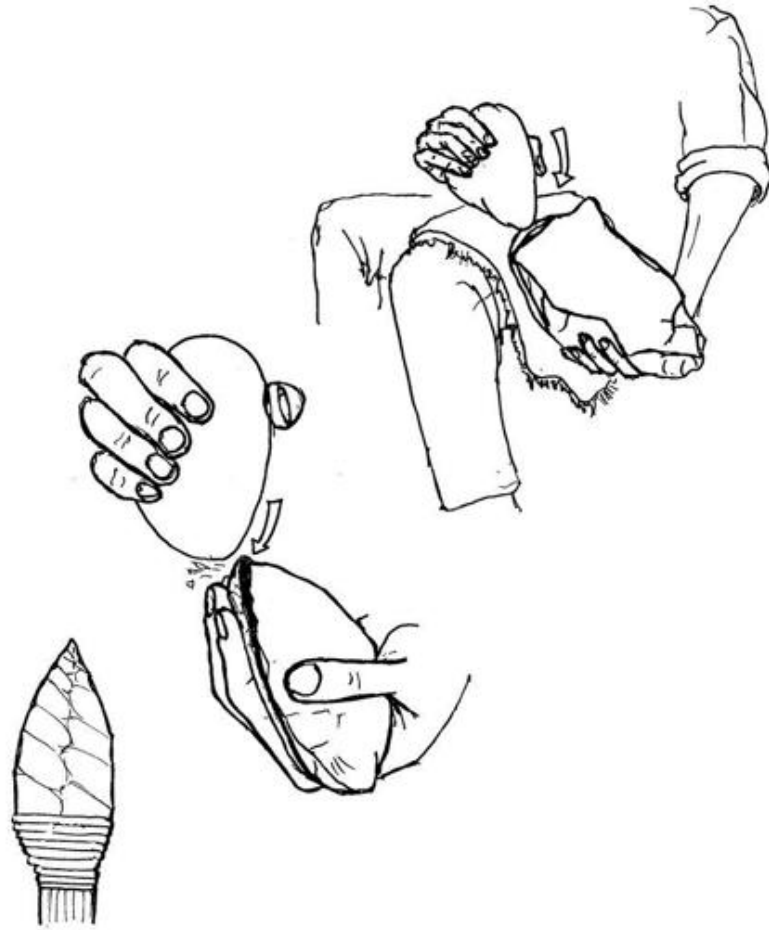
A heavy piece of antler or a slightly smaller egg-shaped pebble can be used to shape your flake roughly by selectively knocking pieces off in a similar manner to your original flaking efforts to make a spear tip or axe head. The little shards and flakes make perfect arrow and atlatl dart heads, needing only to be bound into a split at the business end of a wooden shaft.

22. Flint knapping

Right: Use a large hammer stone to break open a flint nodule and create a striking platform.

Left: Smaller flakes can be knocked free with a smaller hammer stone. These flakes provide a razor-sharp edge. Shape and refine your flint flake using similar well-aimed blows with a small pebble to remove even smaller flakes from the underside, all around the edges – a specialized technique known as knapping.

Far Left: A knapped spear point.



Using other materials

Many other non-flint rocks can be broken to leave a sharp edge, and with time and effort they can be abraded using sandstone and water to shape and sharpen the cutting edge. In addition, bones and antler can be used. Bones can be smashed or split with a stone wedge and the smaller sections abraded into spearheads, harpoons and even needles. As for antler, this absorbs shock more readily than bone, so you'll be lucky to snap a piece using brute force. The trick here is to scorch the section you wish to break, then score it with a piece of sharp stone, before hitting it with something hard to (with luck!) break it in exactly the right place. To work the smaller sections, soak the antler in water for a few hours, then carve it like green wood, using a stone flake to produce fish hooks, gorges (primitive types of fish hook) and harpoons that are less brittle than the bone versions. In some parts of the world, even shaped and abraded bamboo has been used for weapon points and sharp cutting edges.

SHELTER

Protection from the elements and a home from home

My first experience of real sheltercraft was during a visit as a teenager to a reconstructed Iron-Age roundhouse on the site of an ancient fort in south-west Wales. As I walked through the doorway, under the hewn timber lintel, the familiar smell of wood smoke hit me. Inside the house it was warm and inviting, offering total protection from the Welsh weather. A small open fire smouldered in a central, shallow pit surrounded by clay pots and grinding stones, the smoke lingering in the eaves above, staining the rafters black. Carved wooden beds and seats covered with furs and hides were the only furniture needed. Here was a proper home, built from the surrounding hillsides with each and every construction material still easily recognizable from its previous life as a tree, reed or sapling. Certain qualities had clearly been utilized, such as the crooked timbers forming the door arch or the long, straight but bendy hazel providing the woven structure for the wattle-and-daub walls. Although this was a recent reconstruction, the original builders must have known the qualities of each component intimately, how to work it, where to find it and how to harvest it so that it grew back again. I studied every inch of the interior, soaking up the smoky atmosphere, looking for clues as to its construction that I could take away with me. I had built camps and dens in the woods before, but this was master craftsmanship. That little circular building had a massive impact on me, and I have tried to emulate it ever since in the hope of recreating some of that magic.

Like so many of the different aspects of bushcraft and wilderness survival training, learning how to find or provide shelter for yourself and other members of your party has a multi-faceted purpose. Providing shelter in an emergency is normally number one on your priority list, followed closely by the ability to light a fire, then find water and then, least importantly, find food. During your experiments with shelter building, you'll hardly even realize that you're also developing and honing fundamental life skills that have applications in many other areas too. Knots and lashings, cutting and working with wood and other natural resources, hazard awareness and an enlightened understanding of your surroundings are all beneficial byproducts of shelter craft. Developing your shelter-building skills is like re-learning a basic ability we all once had that has become rusty through a lack of necessity. You will start to understand the basics of building and construction, predicting how much load a material can take or how strong a supporting beam needs to be. Angles of roof pitches and drainage become incredibly important where they once sounded like subjects only your dad would find interesting. You will notice that the principles of making shelter are just as important when you're pitching a tent as they are when improvising a home from sticks, leaves and earth. By taking everything back to basics, you will start to realize why modern tents and even houses are made the way they are. The bigger picture reveals itself like an ancient manual of house building.

PLANNING A SHELTER

As any architect will tell you, planning is the most important part of any construction project. Charging headlong into the building phase is a common mistake that often results in a cramped, leaky, possibly dangerous home, which certainly aren't desirable qualities. So, to avoid a lot of wasted time and energy, maybe even a total shelter rebuild halfway through the night (yes, I am speaking from unfortunate experience here), a quick run through of all the components that could contribute to a warm, comfortable and safe night's sleep is vital. Construct the shelter in your mind first, with all the following points taken into account, and keep checking and re-checking as you work. Your plan may also need to evolve slightly as you build, depending on available materials and other emerging factors.

What are we sheltering from and for how long?

The shelter may only be needed to provide shade from the relentless sun or protection from the wind, in which case it could be up and built pretty quickly. On the other hand, a shelter from driving rain and snow will need more of a time and energy investment to make it effective. In most emergencies, your primary aim will be to provide sufficient shelter to see you through the night, but what if the weather conditions are so awful that a shelter is needed throughout the day as well? You might need to incorporate a warming fire in really low temperatures and enough room to move around and cook inside. Building something temporary that can have an extension built on when you get time could be a good plan. Beds, doors and patios can all be added as the days go on.

WHAT MATERIALS ARE AVAILABLE?

Tarps and plastic survival bags can be worked into a natural shelter framework to speed up the construction or improve its protective, waterproof qualities, so use them if you have them. If big and strong enough, they could be all the shelter you need. Think carefully about using vehicles as emergency shelters, as they can be even colder inside than out in winter conditions and swelteringly hot in the heat. However, they can provide you with useful materials in a survival situation: insulation from the ground in the form of seats and carpets, and a sturdy support for a lean-to when combined with a tarp. If you need to attract a rescuer's attention, a vehicle is a lot easier to see from a distance than a modest construction made from rocks and sticks; and it makes an excellent signalling device if the lights and horn still work.

WHAT TOOLS ARE AVAILABLE?

Cutting strong wooden poles of the perfect size and dimensions isn't easy if all you have is a penknife. Fallen dead wood (less than ideal) or thinner, more easily harvested green wood may have to be used for the main structure, which will definitely influence your shelter design. Adapt your plan to meet your capabilities and resources.

CAN EVERYONE HELP?

You may have people in the group who cannot contribute to the build but still need somewhere to sleep. Think carefully about how this will affect your building plans. Divide your workload so that any non-builders can be kept busy collecting firewood or preparing food, if their situation allows it.

HOW MUCH TIME DO WE HAVE?

In most cases you will be working to a deadline, and that is the setting sun. If you're unsure of the local sunset time (and can see both the sun and the horizon), then here's a simple trick to find out how long you have until the lights go out. Hold your hand out in front of you at arm's length with your fingers lying horizontally. Count the number of fingers that will fit between the horizon and the setting sun. Each finger is equal to approximately 15 minutes of remaining daylight before the sun vanishes from sight. You might be lucky and need to use both hands, but if nightfall is looming and you haven't got a sleeping bag, then lighting a fire and collecting enough firewood to last the night are vital tasks that will eat into your building schedule. Getting a simple roof over your head might be all you can hope to achieve.

HOW BIG DOES THE SHELTER NEED TO BE?

For emergency situations and overnight protection, a one- to two-person shelter, just big enough to squeeze inside and make use of valuable body heat while being protected from the elements, can be rustled up in an hour. Colder conditions or a larger group might call for a larger design incorporating a fire to warm the shelter occupants. You may need to find a happy medium here. Given the choice, most people would go for a luxurious pad with double garage and servants' quarters, but you must remember your time limitations, available building materials and the capabilities of your workforce. Don't set out to make something too ambitious at the start.

You'll need to make absolutely sure that your shelter is going to be the right size once it's built. Rough markings on the floor to show the limit of the shelter's footprint will be vital here. I would always recommend that everyone who plans to sleep in the shelter should physically lie in their sleeping positions inside the planned footprint to make sure the size is OK: not too big, not too small.

WHAT HAZARDS DO WE NEED TO BE AWARE OF?

There are potentially loads! Rising water, floods, biting insects, poisonous reptiles, dangerous animals, falling trees or rocks, avalanche, risk of fire if using an open fire to heat the shelter ...

Have a good look at your environment before starting to build. Little hollows and gullies that appear dry at first will be the first places to become flooded in a downpour. Study the local tracks and trails and look for signs left by the regular inhabitants. The last thing you want when trying to survive a chilly night is to discover you've built your house in the middle of a large predator's back yard or high street. Always look carefully through the leaf litter (with a stick, not your hands) for any small but deadly sleeping partners, and don't ever forget to look up for potential rockfall, avalanche risk

or large, precarious branches. Falling wood is extremely common in any forest and has earned itself the cheery name of 'widow makers' or 'widow wood'.

HOW WILL LOCAL WEATHER CONDITIONS AFFECT THE POSITIONING OF THE SHELTER?

Give a lot of thought to the elements you are trying to protect yourself from. Which direction does the prevailing wind come from? Foul weather coming right in through the door needs to be avoided, so work wind direction into your plan. In most cases, having the wind hitting the back of your shelter (the outside, not the inside) is the preferred option, but when using a fire in front of a lean-to this can create an eddy that blows the billowing smoke back towards you. Wind blowing across the front but coming slightly from the rear should ensure the smoke is carried away.

For an indication of the prevailing wind, look around at any local, exposed vegetation to see how its growth has been influenced by the wind direction. Failing that, watch the smoke from the campfire to see which way it rises.

The sun's position isn't essential, but watching where it rises and sets is worth doing. You've only got to go walking in the high mountains to notice how permanent shading from the sun affects certain areas. Long after the big snow has melted and the flowers are basking in the summer warmth, it's still possible to find large snowdrifts in cold, shady hollows that never see the sun.

HOW CAN THE JOB BE MADE A LITTLE EASIER?

Energy could well be in short supply, so you must make use of any existing natural shelter and site your shelter close to your building materials, firewood supply and, if possible, a source of drinking water. A lot of time can be wasted carrying shelter thatch or heavy rafters from one place to another – much better to choose a site where the raw materials are on the doorstep. Making use of natural shelter will conserve energy and maximize the hours of remaining daylight for other tasks, such as making fire or finding water. Caves and rock overhangs have provided shelter for mankind for many thousands of years, but are often dark, damp, cold places with a serious risk of being squashed or entombed forever by rockfall. Coastal caverns must be checked for indications of flooding or being cut off at high tide. Of course, there's always a chance that a cave might already be inhabited by creatures that have you on the menu. A neat pile of human bones outside the cave entrance is a sure giveaway!

Dense overhead vegetation is another time-saving feature. This could come in the form of a large leafy tree or arbour. Try to pick something with lots of small leafy branches sprouting from the main trunk, such as holly or mature conifers. Trees with large, thick branches overhead should definitely be avoided due to the aforementioned 'widow wood' tumbling down in high winds, especially after heavy rain. Beech is a frequent offender in this department, and I've witnessed massive limbs crashing down in the night for no apparent reason, sometimes taking half of the main trunk with it! Not something you would want ruining your beauty sleep. Also, steer clear of woodland consisting of trees with shallow root systems and weak soil that clearly take a battering from the prevailing wind, as indicated by an unusually high number of fallen trees all pointing in the same direction.

Stay alert to the possibilities of a natural shelter, maybe even cutting a journey short if you find the ideal spot, and don't keep a rigid idea of the ideal shelter site in your head. Keep an open mind and remain adaptable. I have slept inside a thick hedge on more than one occasion and been very warm and sheltered, albeit a little squashed. Hedges provide great shelter – just ask a hedgehog.

GETTING DOWN TO WORK

By now, different elements – such as an understanding of natural history, traditional crafts and a bigger picture of the lie of the land – are starting to emerge. You thought you just needed to know how to build a shelter. But no, instead you need detailed knowledge of different tree and plant species and their characteristics, soil types, woodworking, prevailing wind directions ... Of course, you can muddle on without this extra dimension to your mental survival kit, but this is where the 'craft' part of 'bushcraft' or the 'skills' bit of 'survival skills' speaks for itself.

Using what you've got – tarp shelters

Even if you have a tent, tarp or poncho to use as a shelter, all the above checks will still apply. It still makes a lot of sense to mentally work through each point on the list when searching for a safe and comfortable campsite. Knowledge of working with natural materials can also enhance a modern tent's performance. In harsh winter conditions, a tent can be surrounded by the sturdy timber framework and thatching of a natural shelter, which will provide increased warmth, extra protection from heavy snow and a covered porch area to work or store equipment in. Waterproof tarps can be pitched over a strong shelter frame, log walls can be built to enclose a cooking area, and predator-proof fences can be made from thorny brash to encircle a camp.

When training or travelling, and given the choice, I would always choose a properly constructed natural shelter instead of a tent or tarp. It's an incredible feeling to be able to create a warm, comfortable home entirely from the woods, giving you the opportunity to travel ultra-light and merge into the forest. However, they are time consuming to build and can sometimes have an impact on the local environment if resources aren't as plentiful as they need to be. Therefore, unless your trip is focused entirely on improving your knowledge of natural shelter, I would always suggest you take a sleeping bag, thermal mat and a lightweight tarp or waterproof poncho to sleep under. (Tarps are also extremely versatile, having many other uses, such as rainwater traps, improvised stretchers, the lining for a camp reservoir and even the skin for an improvised coracle!)

Lightweight tarps, or 'bashas', are single-skinned shelter sheets that pack down nice and small. Even large sizes can be easily carried, giving you a 3–4m/3–4yd square of dry working and living space. Waterproof ponchos are a lot smaller and will give just enough room to sleep under, as long as you aren't a giant.

Set your tarp up with long guy lines on each corner and a good length of stronger cord (around 6mm/¼in thick) to act as a ridge line. (These lengths of cordage can also be used for other survival tasks in an emergency.) Coil them up and secure with a slip knot when you pack up, then they'll be ready to go and tangle free when you come to

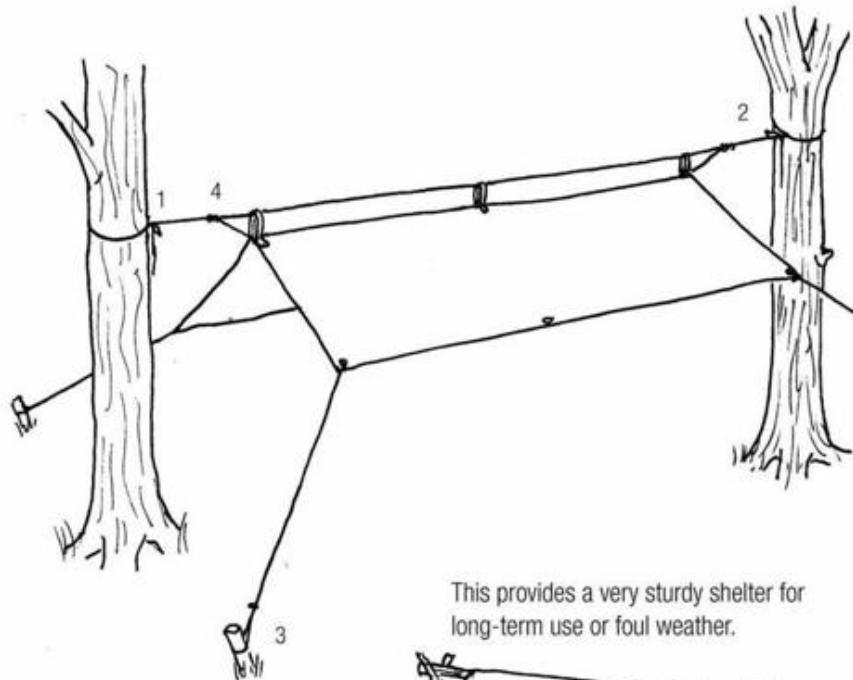
pitch camp again. Guy-line pegs can be improvised easily enough – even heavy rocks and protruding roots will provide a good anchor point – but if you're keen to avoid any environmental impact, then pack a set of lightweight tent pegs or pre-cut stakes. If you're using a waterproof poncho, anchor it with removable elastic bungees with a hook at each end.

Making a shelter from natural materials

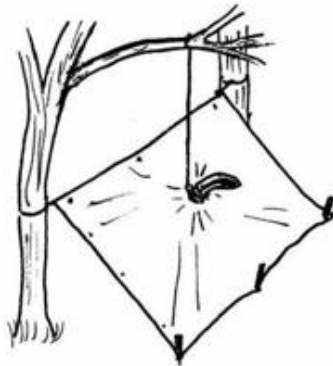
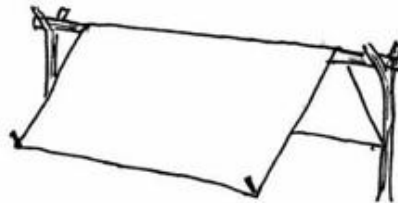
If you've got nothing with you that could be pressed into service as a shelter of sorts, then you'll need to consider the natural materials close to hand. Refer to your mental checklist and look for a site with building materials nearby. More often than not, this is going to involve being near trees, preferably a woodland of some sort. Without getting into the realms of specialist long-term dwellings, most temporary shelter designs revolve around some sort of roof as the main component. Walls and doors come later. With simple survival shelters, the roof is normally also a wall, in that it extends down to meet the floor, so providing a barrier against the elements. Cutting out the bitter wind means you effectively eliminate the risk of having your valuable body heat whisked away by convection and so can create a stable environment where you stand a much better chance of increasing the temperature of the air around you. Body temperature must be kept at around 37°C/98.6°F, with anything lower than 35°C/95°F being classed as hypothermic.

23. Tarp configurations

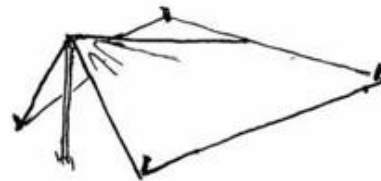
This is typical of a forest tarp set-up. It can be set up low to provide all-round weather protection or high to provide a dry space to work under or sling a hammock. The numbers correspond with the specialist tarp knots shown on the next page.



This provides a very sturdy shelter for long-term use or foul weather.



Basic lean-to design using a waterproof poncho. Tie the hood up and tension it out to a branch to provide more space inside.



One-man tent design, handy for open, treeless areas. The single pole could easily be a walking staff.

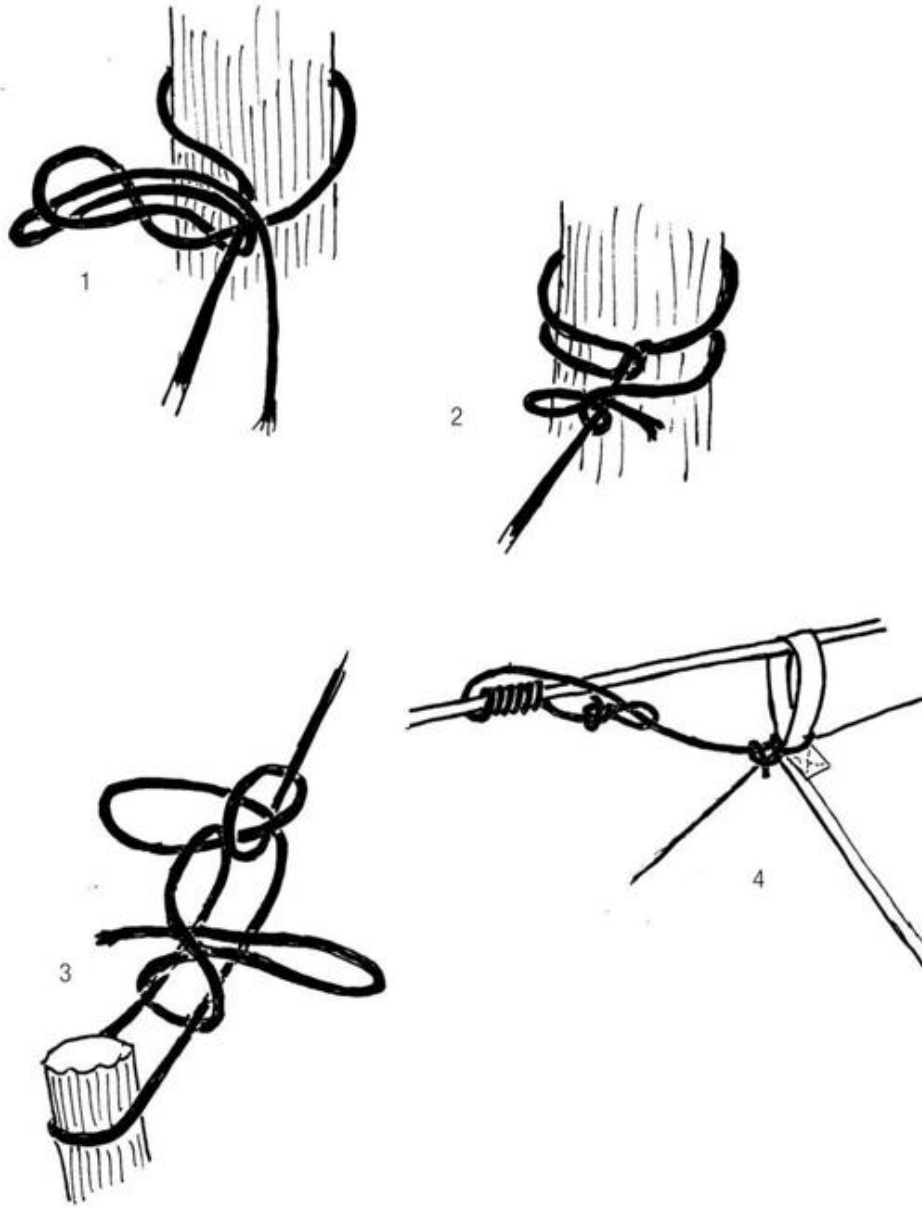
24. Useful knots for setting up a tarp

1 Slip knot for initially securing the ridge line to a sturdy post or tree. The running end is never pulled completely through and the knot is pulled tight by pulling the ridge line. Pull on the running end to release it.

2 Similar to 1, but wraps one turn around the opposite post, only to loop over the ridge line and go back around the post before tying the slip knot. This provides extra tension.

3 The lean-to: an easily made open-fronted shelter with a steeply sloping roof for shedding heavy rain. Close attention must be paid to the wind direction before building this and it will more than likely need a fire in front to provide warmth.

4 The teepee: this shelter requires more work to build but provides room to work and move around and all-round weather protection. It is the perfect shape to draw smoke from the small, warming campfire in the centre up and out through the chimney. Note that the beds have been built prior to thatching, a space has been left for a doorway and the shelter thatch must stop just above the horizontal spar to leave a hole to let smoke out.



So, a good starting point, after considering all the other contributing factors already mentioned, would be a sloping screen providing protection from the prevailing wind and good rainwater run-off. This concept of a combined roof and wall can then have similar sides added: two will make a double lean-to, three becomes like a teepee, four is known as a 'wickiup' and five sides start to resemble a traditional circular shelter, providing all-round protection for a small group. There are many types of shelter, but the planning phase and basic construction principles remain the same.

BUILDING A FRAME

The materials used to construct the framework of your shelter will obviously vary depending on the environment you find yourself in. You could be using rocks, cut snow blocks or existing trees to build your supporting structure. Generally speaking,

the pitch of your roof should be at an angle of around 50°–60°: the steeper your pitch, the better it will be at shedding the worst wind-blown rain. Your frame-building materials should also be strong enough to support the weight of your roof covering even when heavy with moisture, covered with snow or pummelled by high winds.

There are no hard and fast rules with regards to wood dimensions, but as a general guide, if your structural posts and rafters can be bent slightly by hand without too much effort, they won't be strong enough to support a thick layer of damp thatch. With horizontal ridge poles, the longer they are, the thicker they need to be to avoid any flex. In most circumstances, you'll need to use freshly cut green wood in order to achieve the strength required. Intermediate rafters need not be as strong because their main purpose is just to close up any gaps and stop the roof covering material falling through.

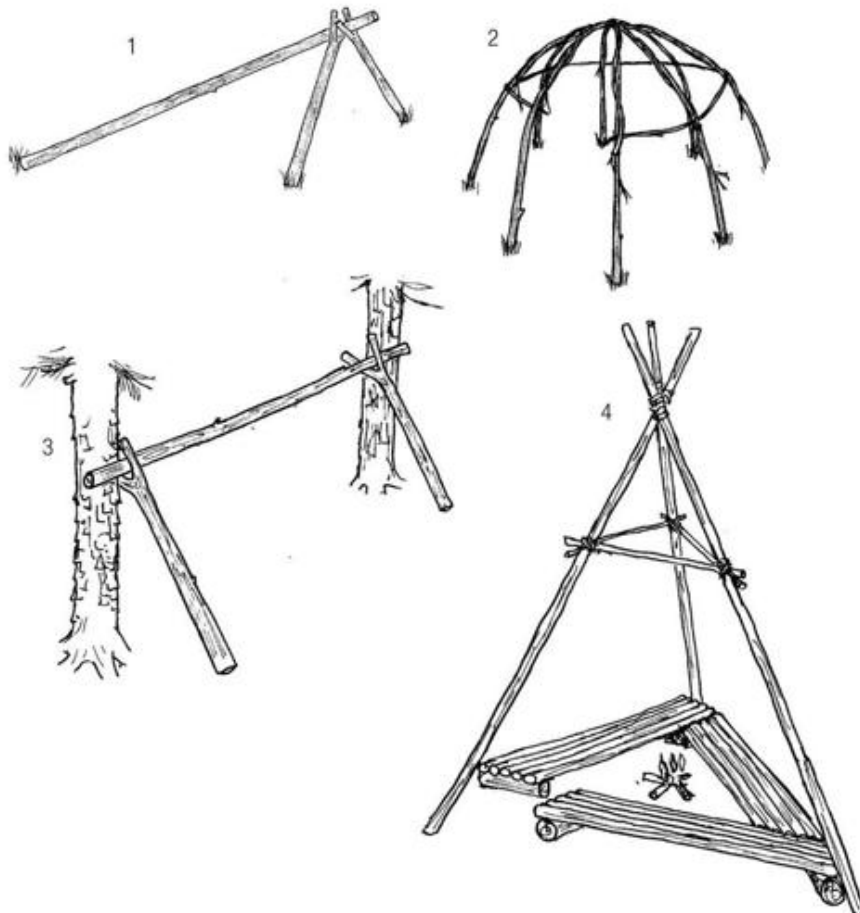
25. Shelter frameworks

1 The A-frame or kennel shelter: an overnight survival shelter just big enough for one person and their bedding. The two long sides are thatched with thin branches, leaf litter and forest debris, leaving a tiny entrance to crawl inside.

2 The bender: a surprisingly strong dome shelter using pliable saplings interwoven. The traditional covering for these would have been animal hides or large sheets of bark.

3 The lean-to: an easily made open-fronted shelter with a steeply sloping roof for shedding heavy rain. Close attention must be paid to the wind direction before building this and it will more than likely need a fire in front to provide warmth.

4 The teepee: this shelter requires more work to build but provides room to work and move around and all-round weather protection. It is the perfect shape to draw smoke from the small, warming campfire in the centre up and out through the chimney. Note that the beds have been built prior to thatching, a space has been left for a doorway and the shelter thatch must stop just above the horizontal spar to leave a hole to let smoke out.



You may be able to save a lot of time and effort while increasing the strength and stability of your shelter by choosing conveniently spaced trees as the main structure, with protruding branches at the correct height to support a ridge pole. If this isn't possible, then select your building timbers carefully to make use of any natural forks in the timber. These will add strength to the framework and possibly eliminate any need for lashings.

For self-supporting structures, the main posts may have to be dug into the ground slightly, and archaeological evidence has shown that timbers used for this purpose were often charred at the base to make them last longer in the soil. Remain adaptable to your surroundings and situation, though, as some very strong structures can be built using thin, bendy green shoots interwoven like a huge open-weave upside-down basket. Handy if you've only got a knife to cut with.

BINDINGS AND LASHINGS

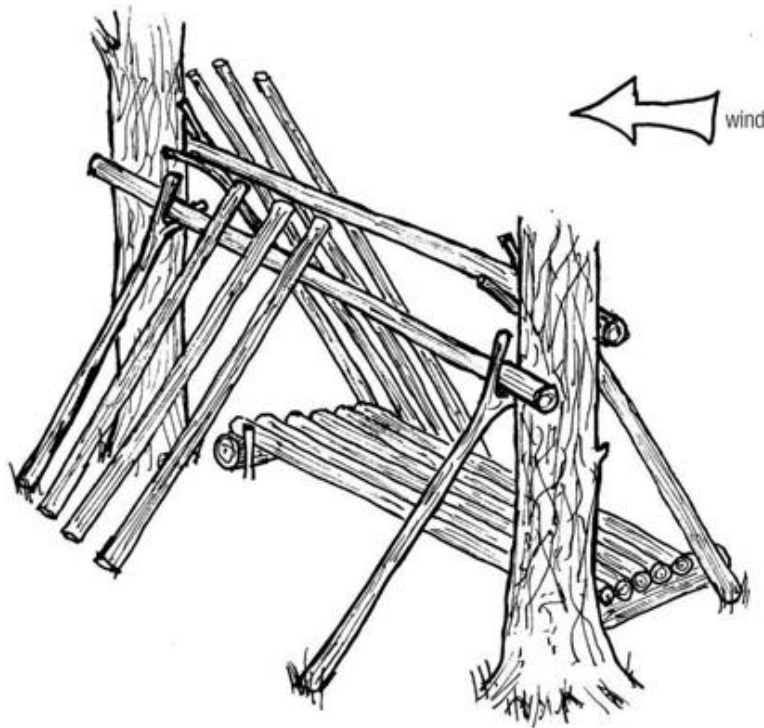
At some point, unless you've been very lucky with your chosen shelter site and timber selection, you'll need to improvise strong bindings to lash up joints. Deciduous woodland should be able to provide you with withies: long, green shoots of hazel, sweet chestnut or willow twisted to make them pliable. Strong, flexible roots from conifer trees or birch can easily be dug up and used in the same way, and plenty of trees have very flexible bark that can be removed in strips with a sharp blade. Be aware, though, that removing bark from a tree thoughtlessly can kill it. Check the advice on page 267 before applying knife to bark.

THATCHING AND ROOF COVERINGS

As far as weatherproofing goes, your roof-covering efforts determine whether you've built something to protect you from the elements or just an interesting hollow sculpture. Often, this is the part of shelter building that really requires you to dig deep mentally as you near the end of the task. It's all too easy to skimp on materials, which could bring dripping disappointment halfway through the night if the rain comes in. Again, be adaptable to your surroundings and resources, as there are a multitude of different materials that can provide good cover. Coniferous branches, large leaves, moss, tiles made from bark and wood, turfs, dry grass and vegetation, leaf litter and reed bundles are all good and fairly easy to gather if you're in the right place.

26. A two-person variation on the lean-to

Using trees as supporting posts provides a trunk-sized gap between lean-tos, which acts as a chimney. Note how the side facing the prevailing wind has been built to oversail the opposite side, preventing rain from blowing in through the chimney but still allowing the smoke to escape.



With any thatching, it makes sense to start at the bottom and work up in order to achieve an overlapping coverage. When using coniferous branches and large leaves, make sure the stem is uppermost for the best rain-shedding qualities. A large fallen pine or birch tree can often be a great source of roof covering, as the wood inside rots faster than the bark, leaving large plates of thick bark that make an excellent and very easily gathered tiling material. Even the leaf litter from the woodland floor makes a suitable roof covering if you pile it on thickly enough. Using a simple improvised rake to gather large quantities of the stuff on a coat or blanket laid flat on the ground will make carrying it easier and faster.

27. Five lean-to frames in a circle provide a group shelter where several people can benefit from one fire.

The rafters, brash wood matrix and thick thatch are built up in stages, ensuring that opposing sides carry an equal load to avoid collapse. When finished, it provides all-round weather protection and a large smoke hole. Note that one bay will be left slightly open for a door, which can be a moveable woven and thatched framework, as shown.



Another labour-saving tip when using leaf litter and vegetation as thatch is to place large logs around the base of the shelter. These don't have to be sturdy and could even be quite rotten, as their only purpose is to add bulk and stability to the shelter where it meets the ground. This first layer of logs gives you a head start on the amount of thatch required at ground level. You must aim for a thatch thickness of 30cm/1ft overall to keep the weather at bay, and this tends to be even thicker at the base to support the thatch above it, so the addition of a log or two will form some of that volume. To check your progress, periodically duck inside the shelter as it takes shape and look for any chinks of light shining through the thatch. It should be as dark as a dungeon inside, because if the light can get through then the chances are that rain will too. Finish off by laying some long, heavy logs all over your newly thatched roof to keep everything in place should the wind pick up.

Beds

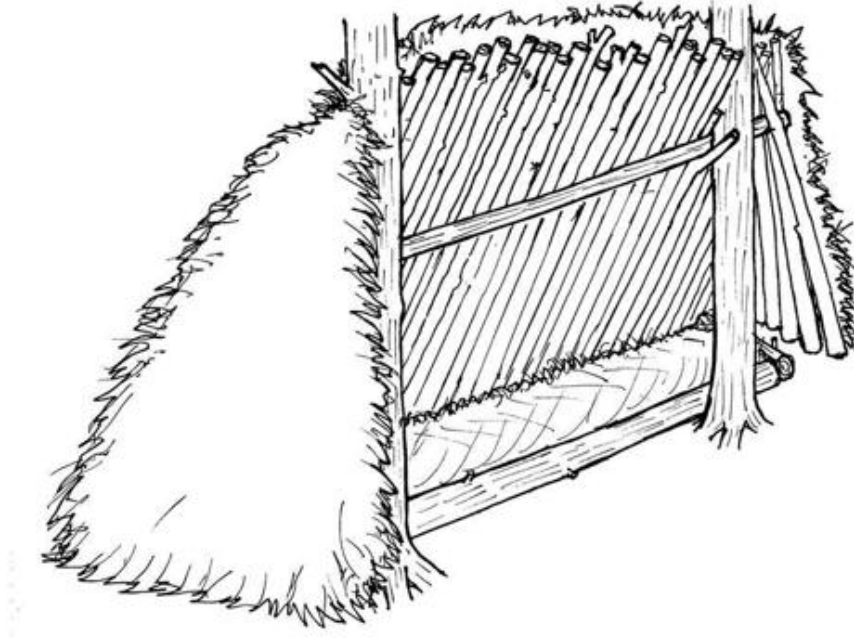
An extremely important part of any shelter, but often overlooked, is some sort of bed. Vital body heat can be sucked away via conduction if we sit or lie in direct contact with the cold earth. However, this can prove useful in desert climates, where digging down through the layer of hot surface sand to the cooler layer underneath can help to keep you cool during the day. In a tropical environment, a raised bed will provide protection from biting insects and dangerous critters on the forest floor. Generally, in any other environment a bed of some sort will help you win the battle to stay warm.

If you have all your equipment with you, then your sleeping bag and thermal mat should be sufficient for your bed. But if these items of kit get lost or ruined, or aren't up to the job, knowing how to improvise a bed from natural materials should ensure that you get to see the next morning. Improvised bedding can be something as simple as a thick pile of dry vegetation, such as the surface layer of leaves or springy spruce boughs. Dry bedding is important, as damp vegetation will transfer vital body heat away from you. Bear in mind that the weight of your prostrate form will compact the leaves down considerably, so make sure your mattress is thicker than you think you

need. Also, don't forget to check your bedding regularly for unwanted visitors, such as snakes or insects.

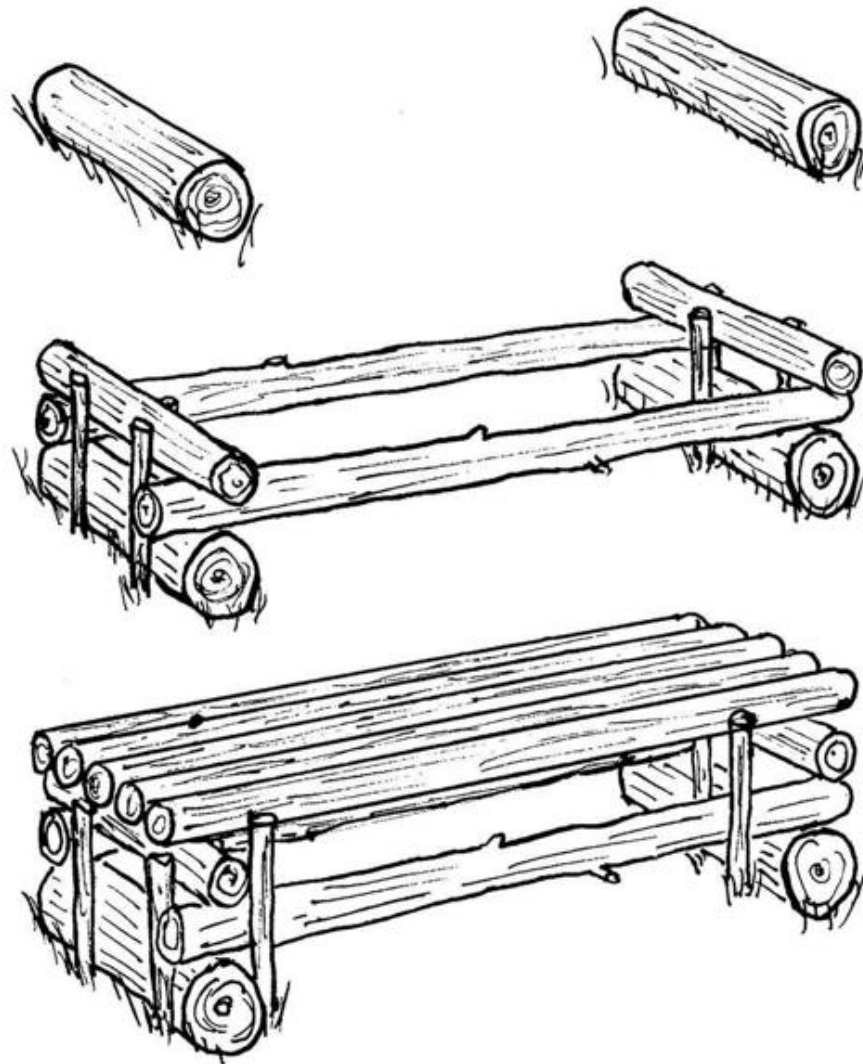
28. Lean-to with cot-wall bed

This fully thatched lean-to has a thick pile of springy twigs and branches covered in a layer of soft, dry foliage as a bed. The bedding is held in one place with logs pinned securely with wooden pegs to stop them rolling away.



29. Long pole bed

A raised bed to get you well away from the cold, damp earth and let warm air circulate underneath. Lay a good covering of springy, soft bedding on top for comfort. This bed also doubles as a bench seat.



Securing one or two long, horizontal logs with posts hammered into the ground will help keep your bedding where you want it to be and stop it spreading out as you sleep. These types of beds, known as 'cot walls', are quick and easy to make, but you must make sure that you don't sink down behind your log wall when relying on the heat of a fire for warmth, as the log will then become a barrier shielding you from the warmth. Laying a springy thickness of spindly branches down before your softer top layer can help here and greatly increase your comfort too.

More extravagant beds can easily be made by supporting long, smooth poles on top of two big, hefty logs laid at right angles, top and bottom, to provide a sturdy, raised base to take your improvised mattress. This sort of bed doubles as a bench seat in a large winter shelter. If you're lucky enough to have time on your side when building your woodland shelter, your long pole bed can be built before the walls and roof, for ease. You'll completely understand why if you've ever tried to fit a big wardrobe or new sofa into a small house without knocking chunks out of the walls as you do so. Of course, if time is of the essence, then your priority is to get a roof over your head and worry about bedding later.

Fires and heating

At times during my training, I have deliberately set out to spend nights outdoors in winter without a sleeping bag, thermal mat or any type of modern luxury, even a wool blanket. In my teens, these freezing-cold experiences were mostly about seeing how far I could push myself in a testing environment, but as my knowledge grew and I became slightly older and wiser, I became interested in how, with a little extra hard work, a relatively comfortable natural bed can ensure a good night's sleep. (It's worth noting that whenever I've carried out these training exercises, I have always had a slightly less stupid friend with me and my normal sleeping kit on standby in case things didn't go to plan. The craft is long to learn and life already short enough without cutting it even shorter for the sake of a daft experiment!)

You may well be able to shiver the night away and survive until the next day as I did, but a whole night of shivering will use up valuable calories in the fight to stay internally warm. Regardless of whether you have found yourself in an unplanned survival situation or you're just spending time living outdoors, you should always be mindful of wasting energy. So, if you need to sleep outside in extremely cold temperatures with no modern sleeping kit, you're going to need a source of external heat, such as an open fire, as well as a layer of insulation underneath you.

PLANNING A FIRE

Despite the obvious fire risk, natural shelters can be built to incorporate a campfire as long as this is included in your original plan. Allow one good pace (about 1m/3ft) between the fire and your sleeping area, unless your shelter incorporates tarps, in which case you might want to leave a bigger gap because of the risk of sparks burning holes right through them. Think about the size of your smoke-hole chimney, always ensure adequate ventilation and keep the fire from spreading by clearing away dry materials on the shelter floor. Also, always have a container of water or sand inside the shelter as a primitive fire extinguisher, and have an escape plan in case things get out of hand. Remember, you're effectively sleeping inside a funeral pyre waiting to happen!

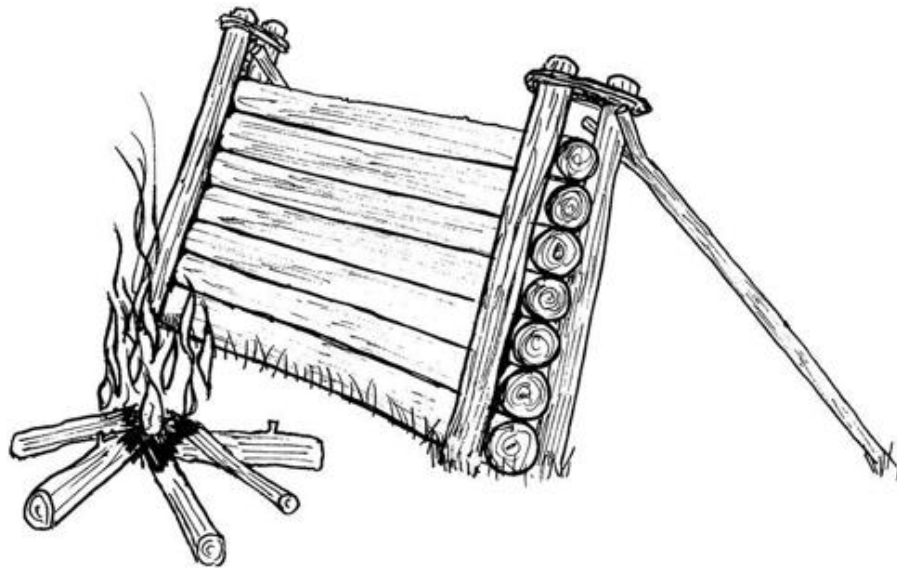
Pay close attention to the size of the fire. A circular shelter with a fire in the centre doesn't need a particularly big blaze to heat it – a modest little tick-over fire will do the job. On the other hand, if you're alone and opting for a simple open-fronted lean-to, then you'll need to keep a good, blazing log fire going all night to keep you toasty warm. With open-fronted shelters, you'll benefit greatly from an additional log wall on the far side of your fire, bouncing some of the radiated heat back across to you. This is a very simple construction consisting of thick logs sitting one on top of the other and held in place by vertical stakes hammered into the ground on either side of the log wall, possibly even bound at the top for strength. A convenient large rock would do the same job.

30. Your fire must be at least one good pace away from your bed for safety



31. Fire reflector

Make the most of the heat from the fire by building a log wall to bounce radiated heat back towards your bed.



UNDERGROUND HEATING

If you've ever used heated rocks to cook your food in an underground pit oven, you'll notice how warm the ground is when you come to uncover it and reclaim your meal. This technique can also be used to heat us from underneath. Please keep in mind, though, that throwing rocks on the fire to heat them up can be a dangerous pastime.

You'll need to dig a trench as long and wide as your body to bury the pre-heated rocks in. The depth of the trench will largely depend on the soil type, but extremes should be avoided: bury the rocks too deep and your efforts will be wasted, but just a skimpy covering of earth over the top could be a painful experience as you wriggle about in the night and expose one of the red-hot rocks. Also, make sure that the covering of earth is not damp, or you'll end up steaming yourself like a shrimp overnight.

Doors

If you feel motivated to try your hand at a bit of shelter building for fun, training or a mixture of the two, then I really hope you get the chance to sleep in it. Only by spending one or two nights in a shelter you have made yourself will you begin to notice the tiny improvements and changes that need to be made in order to make yourself more comfortable and increase the shelter's efficiency. For anyone who normally lives in a house, a huge glaring whopper of an improvement is a door. Just as with building a fancy bed, a proper door is not a priority when it comes to shelter building for survival, but once you have a construction that is able to keep the weather at bay and some shelter- improving time on your hands, you might consider the option of making an effective door for your makeshift home. In single-person survival shelters that are only just big enough to crawl inside, your rucksack pulled in after you will make a perfectly serviceable door, but for group shelters and semi-permanent constructions you'll probably need to make something bigger.

You have several options here, largely dependent on your surroundings and the natural materials available to you. I've made doors from:

- a framework lashed together and thatched like a moveable section of the shelter roof
- bundles of reeds woven together on a simple, improvised loom system to act as a kind of roller blind
- thin, flexible green sticks twisted horizontally through a series of vertical poles to make a mini hurdle fence, similar to a rectangular section of basket weaving
- larger logs split down into planks and used to fashion a sturdy plank door held together with wedged, hardwood pegs

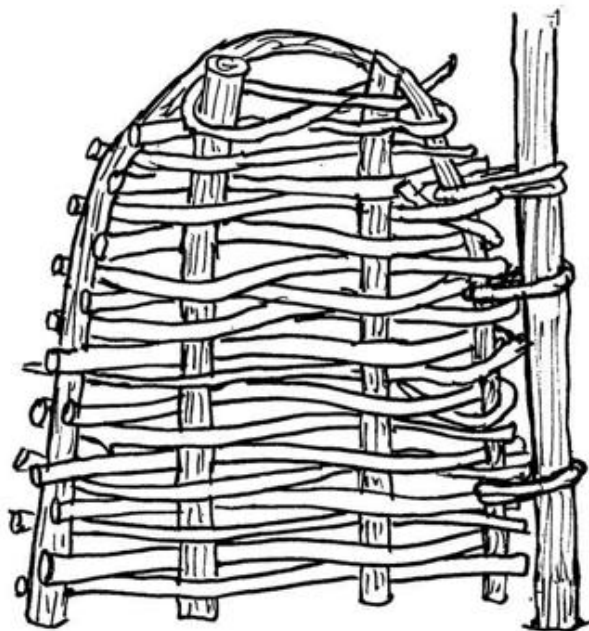
I'm sure there are many other options and you are bound only by your imagination and ingenuity here. Any of these doors need only to be moveable sections of the shelter wall, made to be a snug fit and manhandled out of the way in order to get in and out of the shelter.

If you're a real show-off, you might want to think about adding a handle, building an overhang above the doorway to act as a porch and even coming up with an ingenious method of hinging and latching your door – useful if it turns out to be a heavy lump. Basic hinging and latching mechanisms really show an understanding and familiarity with the different qualities of certain natural materials, advanced craftsmanship, improvisation and problem solving – useful skills to develop in bushcraft. If you're looking for inspiration in this department, then I would suggest studying some of the amazing and ingenious primitive trap triggers still used today in some parts of the world.

In most cases, your shelter door is also your window, but if your shelter is so big and weatherproof that it could do with another opening to let in natural light, then windows can be built in by constructing a smaller version of your door somewhere in the roof with a hinged flap or a moveable section.

32. A well-made door provides total protection from the elements

It keeps heat in and helps the fire draw smoke upwards and out through the smoke hole. This door has been woven from hazel and hinged onto a sturdy post with loops also made from twisted hazel. Any gaps could be thatched or filled with a mixture of clay-like soil and dry grass.



CHAPTER 4

FIRE

Lighting and maintaining a fire in all conditions

In writing this chapter I feel as though we're changing gear and accelerating away, which is just the feeling you get when the fire has been lit in camp. Fire plays an unbelievably important part in any outdoor lifestyle. In its dancing flames we can see the opportunities that weren't available to us before. With the campfire as our friend we have warmth in the coldest conditions, a method of making water safe to drink, inedible food edible and wet clothing dry. We have light to see by at night and a signalling device if rescue is needed. Fire also gives us a method of preserving food, an effective insect repellent around camp and a deterrent against large predators.

Fire has been used in a variety of different applications throughout history. Huge trees were once felled by carrying out a controlled burn at ground level. Once the fallen trunk was horizontal, it could be burnt into sections and even hollowed out with the careful use of fire to make dug-out canoes. On a smaller level, bowls, ladles and cups can all be hollowed out in a similar manner. Wooden spear shafts can be straightened and wooden tools or weapon tips hardened in the ashes to become stronger.

Controlled burning of scrubland was once a method of flushing game towards a group of hunters, and smoke can be used to subdue bees prior to removing their honey or to drive rodents out of their burrows to be caught in a net. Fish can even be attracted to the water's surface (and subsequently the fisherman's harpoon) by the shimmering light of a flaming torch at night.

PRACTICE AND PREPARATION

Fire lighting is such an important skill that anyone venturing into wild country should be capable of successfully producing it in the worst conditions, with minimal equipment. Regular practice is essential, as is becoming proficient with different materials, methods and weather conditions.

Don't panic, though: this level of proficiency is by no means unobtainable to the dedicated bushcrafter. However, it does require a positive outlook, a heightened attention to detail, the ability to solve certain problems and a liberal helping of grit, perseverance and determination – all essential qualities whether surviving in the woods or walking down the high street. Set yourself some goals to reach, such as lighting a fire with a single match. The next challenge could be to do the same with a small glowing coal as your only source of heat. As your confidence grows, the ultimate bushman's skill of fire by friction (or rubbing two sticks together, as it's commonly described) will be within your grasp.

Proper preparation seems to be the ever-recurring theme in bushcraft, but nowhere is it more important than in the art of fire lighting. This life-saving skill is truly around 80 per cent preparation and the remaining percentage flashy technique. If a warming,

crackling campfire is the biggest morale builder of all time, then it stands to reason that failing to get the fire lit when you really need one is going to have the exact opposite effect. To avoid monumental disappointment, you should carry out every individual job as if you won't get another chance. Put your heart, soul and every ounce of your concentration into the task, setting everything else aside. You'll have plenty of time to contemplate life later when you're enjoying the warmth radiating out from the flames you just created! So, with that in mind, your first job has to be to prepare your materials; and, assuming that you're starting your fire from scratch with nothing, your most important material is tinder.

TINDER

The definition of tinder is a material that is so fine, fluffy and flammable that it will catch a spark, a tiny glowing coal or the slightest of flames and burn for long enough to heat twigs and thin slivers of dry wood to the point where they, too, catch fire.

If you're in desperate need of a fire, then the chances are that you're in an environment where rain, hail, snow or some other moist monstrosity is likely to be dampening your spirits, or threatening to. Therefore, gathering a good quantity of bone-dry tinder takes priority in your fire-lighting efforts. In fact, it's always a good idea, whatever the weather, to grab an opportunity when it comes along and to get into the habit of collecting and storing enough dry tinder to start a fire in damp conditions. (Outdoor people in the know carry a little waterproof pouch for this purpose.)

The nature of tinder means that it is a very absorbent material, so it needs to be kept dry at all costs once gathered. By preparing your tinder as a priority over all other fire-lighting jobs, you can ensure that it's kept dry in the event of an unexpected downpour. However, if all available materials are damp already, by gathering it early on you will have time to dry it out slightly by spreading it around the inside pockets close to your body (as long as your inner layers aren't soaked through). As you work, gathering all the other materials needed, the tinder will, with luck, dry out just enough to do its job.

A good rule of thumb when gathering tinder is always to gather more than you think you will need. To achieve a good enough blaze to light damp kindling, you must have at the very least a tinder bundle about the size of a football. Mixing and matching several different materials to create the perfect tinder bundle is good practice. The softest and fluffiest tinder forms the very centre, with the more coarse and fibrous materials around the outside, a bit like a nest.

Suitable tinder

What follows is a selection of suitable tinder materials – some you may have with you, others you may have to gather. This is only a guide, however, and you should experiment with a number of different materials and be prepared to adapt to whatever surroundings you find yourself in. Some materials look as if they should be perfect for the job but in reality don't really come up to the mark. For example, sheep's wool and

dry leaves look potentially good, but they never really produce a flame, just lots of disappointing smoke.

CARRIED OR MANMADE TINDER

- **Newspaper, toilet paper, notebook pages, the boring parts of this book** – Rolling sheets up into balls gives the biggest flames.
- **Cotton wool, field dressings, tampons** – Perfect for catching sparks if fluffed up. Rub petroleum jelly into them for a stronger flame.
- **Alcohol-based sanitizing gel** – A squirt of this turns your cotton wool into turbo-charged tinder and even works as a sort of tinder on its own, producing a little blue flame when showered with sparks.
- **Rubber-tyre inner tube** – Perfect for permanently damp conditions. Needs a good flame from a lighter or match to ignite it, but once alight will burn with a good flame for long enough to ignite damp kindling.
- **Fine wire wool** – Can be ignited with sparks or a low-voltage battery. Nestle it inside some dry grass or bark.
- **Char cloth** – Made before hitting the trail or during your travels once you have a fire. Tear off strips of old, good-quality cotton and pack them into a metal tin with an airtight lid. The lid must have a small hole punched through the centre. Place the tin on an existing fire, and very soon thick smoke will pour out of the hole in the lid. As this smoke thins, plug the hole with a pointed stick to exclude oxygen and remove from the heat. The cloth strips should now be black, fragile and ready to catch the slightest of sparks. Pack them away in a waterproof pouch ready for use. Char cloth glows red-hot when alight and can be used to ignite coarser tinder, which is unlikely to catch from sparks alone.

NATURAL TINDER

- **Dry grass** – Easily gathered, dries quickly.
- **Dead plant stems** – Old cleavers (Galium aparine), nettles, cow parsley, rosebay willowherb. Larger pieces are quite woody, almost like kindling.
- **Dead bracken** – Carefully comb away the fine fronds, but be careful not to cut yourself on the stalks
- **Clematis or honeysuckle bark** – One of the best tinders, as very fibrous and gives a long-lasting hot flame. Naturally hangs off in shreds. Remove only the dead bark.
- **Fatwood** – Shave very fine curls, which can be ignited with sparks.
- **Dead pine needles** – High in resin, will burn brightly.
- **Inner barks** – Dead sweet chestnut and lime give good stringy fibres.
- **Birch bark** – Perfect tinder. The bark contains a natural tar and peels away from the trunk in papery sheets. Collect whenever you see it, but don't remove any bark that isn't in the process of shedding naturally, as it'll still be alive and removing it will damage the tree unnecessarily.
- **Dried fungi** – King Alfred's cakes, or cramp balls (*Daldinia concentrica*), grow on dead ash trees. Pick off these solid, black lumps and strike sparks onto the

concentric rings inside. May need to be dried in a warm pocket first. Will glow red-hot, smouldering for a long time, and can be added to a bow drill ember to increase the transferred heat inside a slightly damp tinder bundle.

- **Amadou** – Made from the brown trama layer found under the hard skin of certain bracket fungi, such as horse hoof fungus (*Fomes fomentarius*). Traditionally, this suede-like material has saltpetre added to it, but in the wild you can either buff or scrape the raw material to create a fluffy tinder or boil it for a whole day and night in water and wood ash before beating it flat and leaving it to dry in the sun. Perfect for using with poor-quality sparks.
- **Fluffy seed heads** – thistles, greater reedmace, rosebay willowherb and wild clematis all catch from a spark and burst into a flame. However, they're all a bit of a flash in the pan, so combine them with bark, bracken or grass for a longer flame.
- **Mosses and lichens** – gather them from above ground level or they could be damp.

CHOOSING A SUITABLE SITE

Once sufficient tinder has been squirrelled away, some thought can be given to laying the fire. Before we go any further, it's worth pointing out that unless you are in a life-threatening situation where your survival and wellbeing are the most important issues, you must always ensure that the area of wilderness you happen to be in actually allows the use of an open fire. Always read the local bylaws regarding campfires, and seek the landowner's permission. Even in a situation where bylaws and regulations become secondary to your survival, there are certain areas you need to steer clear of for safety reasons. Dense, dry vegetation, windy sites, peaty soil, dense coniferous woodland (where the ground layer is made up of needles and rootlets) and any exposed interwoven roots are all surfaces that could actually smoulder and burn, starting an underground fire that will continue after you have left and could develop into a full-scale forest fire when the wind picks up.

Instead, look for a level, open site with natural shelter from the wind and rain, if possible. If not, you may have to improvise a temporary shelter or windbreak. There must be no overhanging vegetation, dry or otherwise, to catch fire, and the ground should be cleared away to bare earth for at least 1m/1yd all around your chosen fireplace. On grass you should turn back a few turfs, which you can then replace afterwards, and in snowy conditions you'll have to dig down to solid ground.

To keep your fire contained, dig out a shallow, circular pit and line the bottom with dry, thumb-thick sticks. Make it about 38cm/15in in diameter and around 13cm/5in deep in the middle, and the heart of your fire will remain contained within. You should even be able to find some glowing embers in the bottom of your fire pit to re-kindle your fire after it has burnt down to ashes overnight. The little improvised stick grate will eventually burn up to become part of the ember base, but in the delicate, early stages of your fire it will provide a dry surface to place your tinder bundle onto, while at the same time allowing oxygen to circulate underneath the fire, just like the grate in a wood-burning stove.

The fire triangle

This need for oxygen highlights an important point. To stand any chance of successfully bringing your fire to life, you should understand the components necessary for it to live. A fire consists of three important components, often referred to as the fire triangle. These are oxygen, fuel and heat (in the form of a method of ignition). The theory behind the triangle is that if one of these components is missing, the triangle cannot support itself, and the fire is prevented or extinguished. It's pretty obvious to most people that a fire needs fuel and a method of lighting it in the first place, but ensuring that enough oxygen is present and allowed to circulate freely amongst the fuel is something that a novice could easily neglect. Oxygen flow can be increased by fanning or blowing. Sometimes, just propping up your kindling slightly is all that's needed.

FIREPLACES

If you've chosen a good location, on good soil, out of the wind and away from thick vegetation, then you shouldn't have any worries about the fire spreading, so eliminating the need to make an enclosed fireplace with rocks. However, in some cases and with the right sort of rocks, an enclosed fireplace can help to retain some heat as the fire dies down for the night. A small fireplace inside a group shelter is a good example.

Whilst a rock fireplace can be quite handy for balancing cooking pots on, it also has a few disadvantages. Firstly, rocks can explode! Most rocks, prior to heating, contain a certain amount of moisture, which expands as it gets hotter, turning your pot-rest into a potential boulder bomb. Best-case scenario is a split rock; worst-case (and I've witnessed this myself) is that you will be dodging red-hot shrapnel as you dive for cover, possibly kicking over your rabbit stew in the ensuing panic. If you must use rocks, gather the driest ones you can find and place them around the fire at a fair distance, gradually moving them inwards to dry them out nice and slowly. Glassy or flaky rocks, such as flint or slate, are the worst and should never be used near the fire. Another disadvantage of a rock surround is that all firewood will have to be cut to a size that will fit neatly inside it. This is a costly waste of energy when long lengths could just have been fed into the fire slowly as they burn. The final downside is that when you break camp and move on, you will leave behind a selection of ugly, blackened rocks rather than a neat and tidy campsite.

As an alternative, green logs can be used on either side of the fire to balance cooking pots on and to offer some protection from the wind – a method known as the 'hunter's fire'. Ideally, these logs should eventually become ashes too, making it much easier to leave no trace when you move on. In most cases, your fire pit should be all the fireplace you'll need. For balancing cooking pots and billycans, you can always make an adjustable pot hanger.

GATHERING MATERIALS

With tinder gathered and a fireplace prepared, you must invest some time in preparing the different stages of fuel to feed the fire once lit. Poor preparation at this point will guarantee a frantic dash around the woods in failing light, searching for suitable materials as your tinder bundle slowly fades away to ashes. Not a good strategy!

Kindling

Once your tinder bundle is ablaze, unless you add to it quickly you will have a very short-lived fire. Keep in mind that a fire is a living thing and must be fed gradually with ever-increasingly thick fuel – too much, too soon will smother it. Therefore, the next addition should be something only slightly thicker and more substantial than the dry grasses, shredded barks and fluffy seed heads that have formed your tinder bundle. Look for thin, dry twigs. I mean really thin, like matchsticks. These spindly twigs should also be dead, but not yet rotten, giving a nice, crisp sounding ‘snap’ when you bend them. If they’ve still got leaves attached or do a lot of bending before finally breaking with a disappointing ‘pop’, they’re probably still green and no good for kindling.

Don’t gather your kindling twigs from the woodland floor, as chances are that they’ll have attracted moisture and be a bit soggy. Look around instead for thin branches that have died but are still attached to the main tree trunk or limb, away from the damp ground and air-dried by the wind. Underneath hedges and trees with dense foliage are also dry, sheltered places to find a stock of dry twigs.

It’s unbelievably tempting sometimes just to gather the materials closest to you, even if they’re clearly the wrong size and floating face-down in a puddle. Give yourself a kick up the rear and go looking for the best and driest kindling you can find, even if it means a bit of a walk. Ideally, you’ll want two rolled-up bath-towel-sized bundles of dry, dead, matchstick-thin twigs about 1ft/30cm long. In really bad weather this amount should be doubled.

Feather sticks

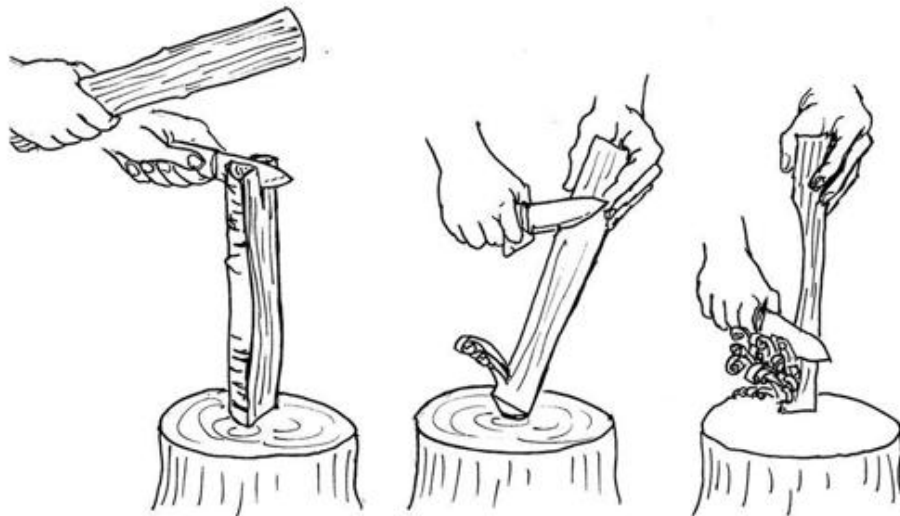
Little backcountry tips like this next one can really tip the balance in your favour. Never again will you feel that fire lighting after prolonged rain is an impossible feat, because as long as you’ve got a sharp blade (be it a small knife or a flint flake), then both tinder and kindling in the form of feather sticks can be manufactured from standing dead wood. Standing dead wood is a tree, or part of a tree, that has died off but not yet fallen down to the damp forest floor. This means that it should be dry inside and well seasoned, making it perfect firewood. In any forest, woodland or small copse you will find wood of this nature if you have a good hunt around. If it’s too rotten, it’ll be powdery and soft; if it’s still green, you’ll notice the leaves. (In winter you can scrape a little bit of bark away to be absolutely sure: if it’s green and slippery underneath, then leave it.) On dead wood, the inner bark will be brown and dry to the touch.

Choose a piece about 5–7.5cm/2–3in in diameter with a section of 30–60cm/1–2ft that is clear of knots and branches and fairly straight of grain. If you haven’t got a saw or axe, then something of this diameter and condition should be able to be snapped

off in the right place. Using a wooden batten and your blade as a splitting wedge, split the log along its length, and you should find that although the outside is wet from the rain, the inside will still be bone dry. Using your sharp blade, and starting at the top of the feather stick, carefully shave slivers of wood free, stopping just short of the bottom to leave as many as possible still attached to the base of the split section. Keep adjusting your cutting position, always working on a sharp edge, and aim to take the thinnest slice off each time. These dry shavings naturally curl up in a bundle at the base of the feather stick and leave you with combined tinder and kindling all in one handy package. Several of these feather sticks will kickstart your fire for sure. Well worth the extra effort!

33. Carving feather sticks

Splitting standing deadwood down to expose the dry wood inside. This dry wood can be finely carved to make bone-dry tinder shavings. When left attached to the wood, you have tinder and kindling in one. These are known as feather sticks.



Fatwood

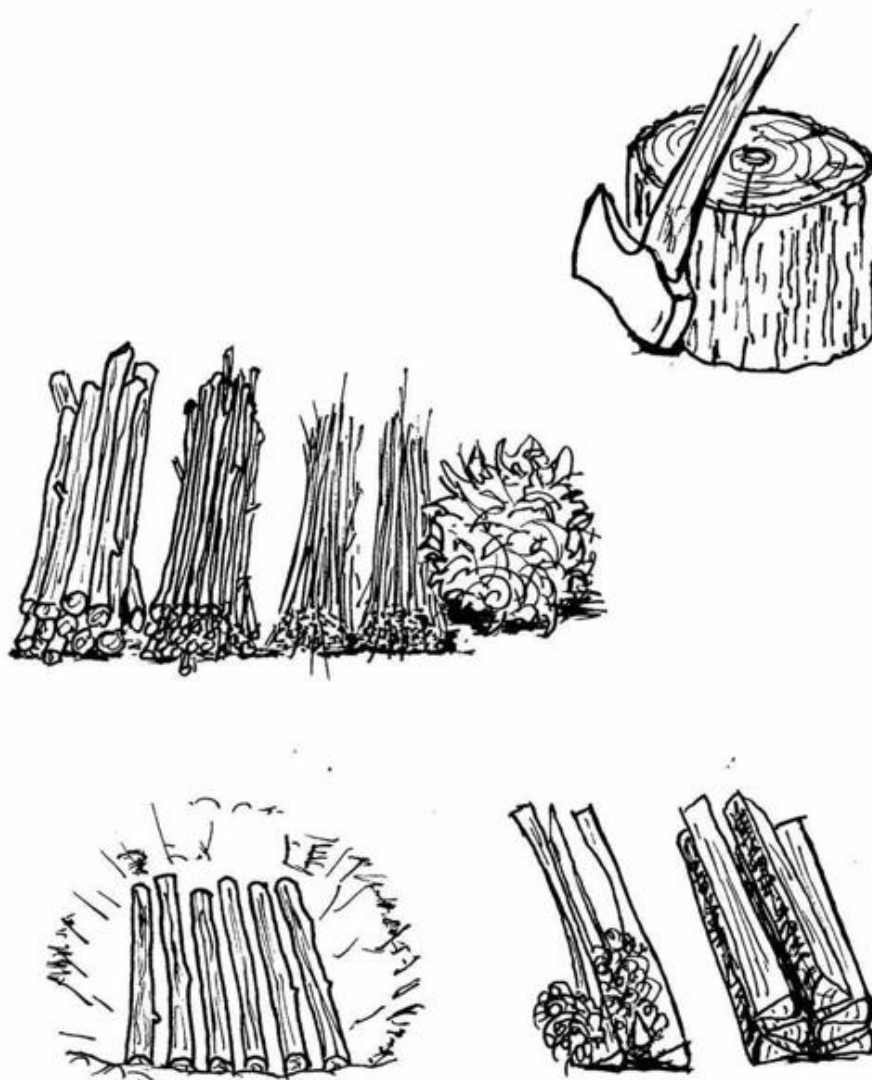
Some woods burn better than, or slightly differently to, others, and you will find that these varying qualities come in useful. Pine trees contain a resin, or 'pitch', which has a multitude of uses. Its flammable nature makes it excellent for fire lighting, and it burns brightly, giving you light to see by in camp after dark. If you find a pine stump with well-seasoned, not yet rotten, wood, you will have a top-rate source of kindling. The stump, which has had its top half either cut down or blown over, will have kept pumping pitch upwards until it died completely, meaning that the stump wood will be heavily saturated with resin and so extremely flammable. Feather sticks carved from split sections of this 'fatwood' will light very easily and burn with a fierce flame, and if you can slice those resin-rich shavings fine enough they will light from a shower of sparks!

Fuel wood

Included in your preparation should be the gathering of a good quantity of fuel wood. Start with pencil-thin sticks, then some thumb-thick ones, working up to wrist thick, to get the fire established. This wood must be dead but still firm, dry and preferably gathered from above ground level. As before, if you're struggling to find enough dry materials, you may have to split down some thicker standing dead wood into thinner sections. In fact, split wood will always burn better than logs left 'in the round', so it's worth taking the time to do this anyway. For fuelling your fire once lit and established, you can search out some good, thick pieces of fallen or standing dead wood.

34. A properly prepared fire

A shallow pit lined with sticks, with tinder, kindling and small-diameter fuel wood (below) and feather sticks and increasingly thicker fuel wood, the larger sections split (bottom).



Gathering good firewood can be a bore, but it is a task that can easily be worked into your day. Staying alert to potential firewood must become second nature, and you should never come back to the campfire with empty hands. Try to avoid letting your firewood pile dwindle away to nothing by keeping it well stocked, especially as nightfall approaches. Stack damp logs around the fire to help dry them out while also

acting as a barrier, providing some protection from the wind. It's incredible how much wood you need to keep a fire going through the night and day, so make sure your fire is the right size. If you build an enormous, raging hot fire, this just means that everyone has to sit further away from it and the firewood requirements begin to spiral out of control. Keep your fire small and manageable and make use of clever bushcraft constructions, such as purpose-built fire-reflecting log walls and windbreaks, to conserve fuel.

For good heat and solid cooking embers, seek out hardwoods such as oak, beech, chestnut, ash, holly, willow, hazel and fruitwoods such as apple. Fallen oak may look rotten on the outside but hardens up considerably with age, producing a rock-hard timber that will blunt every sharp edge you own, but also provide your campfire with a lovely hot ember bed for cooking on. Ash is an excellent firewood choice, and, having a very low sap content, it can even be burnt green if needs be. Sweet chestnut makes good fuel but can be a bit spitty, so shouldn't be used in confined spaces such as the inside of a shelter. Softwoods, such as pine and spruce, and some of the softer hardwoods, such as poplar, sycamore and lime, burn well with a good flame, but burn a bit too fast, giving no real 'heart' to the fire. Keep them to add whenever a burst of flame is needed, for example boiling a billycan of water or increasing light to work by.

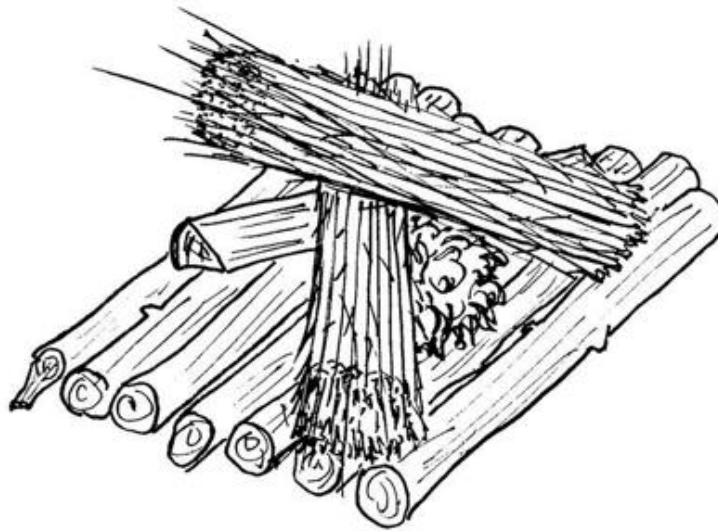
Remain adaptable to alternative, local fuels in environments with little wood. Dried dung and blubber are two possibilities that spring to mind. Once, while working in a forest in Scotland, I was able to pull the dry, peaty, root-filled earth from the exposed roots of large fallen trees and use it as additional fuel for the campfire.

LAYING A FIRE AND PREPARING A TINDER BUNDLE

Remember that a fire needs to grow, so the layout of your fire must reflect this in its early stages. With pre-prepared and ready-to-light fires, such as those used for signalling to a potential rescuer, it helps to have a small, dry log to sit your tinder bundle against. This provides a surface to lay your kindling on, ensuring that plenty of oxygen can circulate and the flames from your tinder bundle aren't smothered and can grow upwards. Before you attempt to ignite your tinder bundle, however, careful preparation of the materials is essential. Take the tinder in both hands and rub it back and forth to break down any larger pieces. To maximize the chances of a small, glowing coal igniting the dry fibres, it must be as fine and fluffy as possible, especially in the centre. Any strands that fall away from the bundle due to your vigorous rubbing can be picked up and popped back in.

35. Tinder and kindling ready to light

Prop your kindling up on a split log to provide maximum oxygen flow and prevent it smothering the tinder.



If using matches, a lighter or similar naked flame, then the bundle can be placed inside your pre-built fire and the flame taken to it. However, if all you can produce is a glowing coal, then your tinder bundle should be held in the hand, leaving an empty space in your fire lay, or construction, ready to accept it once alight. Prepare the tinder bundle by working it into a nest-like shape with a hollow in the middle. Once you have your red-hot coal, gently place it into this hollow, ensuring it's surrounded by tinder, but not smothered. With your back to the wind and your tinder bundle held in both hands, blow long and well-aimed breaths into the centre, watching to see the coal grow hotter with each puff. The wind coming from behind you will help to increase the flow of oxygen and blow any smoke away from your face. Gently push the sides in so that the coal is continuously fed with fuel, but not completely crushed, and look out for the wisps of smoke that indicate that the tinder is starting to catch. The harder you blow, the thicker this smoke should become. Turn your head to one side when inhaling to avoid a lungful of smoke. Eventually your tinder will burst into flame and can be placed into your fire pit ready for the addition of kindling, half of which is placed above the tinder to let the flames grow and spread amongst it. The second half of your kindling is laid onto the first half once the flames start to take a hold, and this is followed by the smallest fuel wood, each piece laid thoughtfully onto the flames to ensure maximum exposure to the heat and oxygen flow. Gradually feed your fire with increasingly thicker fuel until it is established enough to burn freely without constant attention.

36. Igniting your tinder bundle

Keep your back to the wind when blowing into your tinder bundle. Don't put your face too close or moisture from your breath could dampen the air inside the bundle.

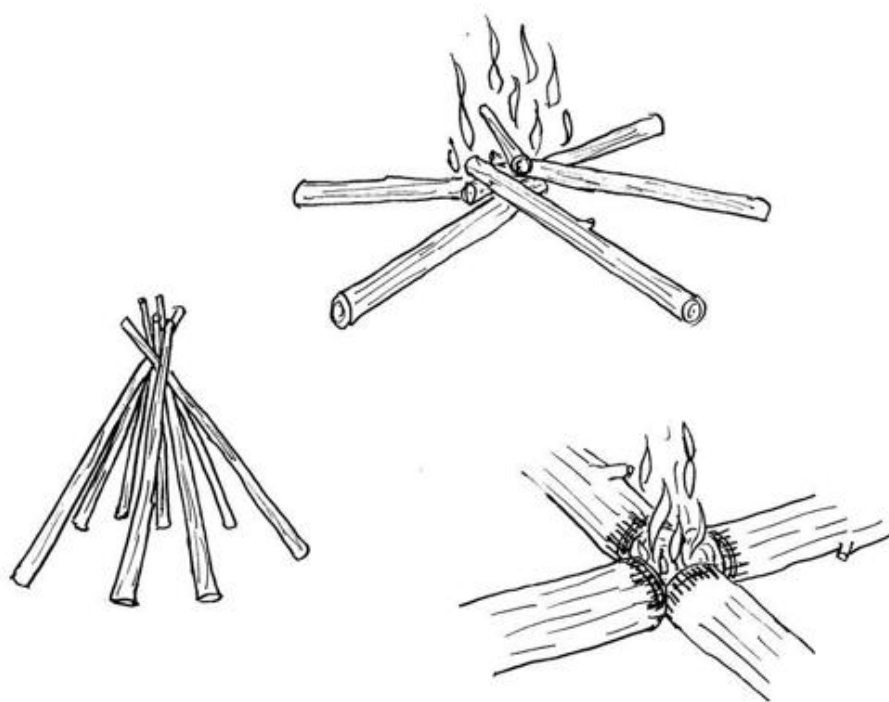


TYPES OF FIRE

There are many different fire lays to suit different circumstances. Some fires will need to be laid, ready to light at a moment's notice, such as the signal fire, whilst others can be arranged while the fire is burning, altering its construction to give more heat, create more cooking embers or conserve firewood, as required.

37. Types of fire 1

Left: teepee; top right: Indian, bottom right: star



Teepee fire

This arrangement is perfect for newly kindled fires, as the conical shape encourages good airflow in through the base and out through the top, like a chimney. Any damp sticks are entirely exposed to the rising flames, giving them a better chance of lighting. Build it up in grades, with the thinnest fuel wood near the centre and the thickest around the outside. Be aware that if this fire is too solidly constructed or you have been too mean with your tinder, the middle could burn out, leaving a scorched hollow structure. Arrange it so that each thickness of fuel wood happily collapses in on itself as it burns, self-feeding. Eventually the whole structure will collapse, but by this time you should have a well-established blaze underway and new fuel can be laid on top.

Indian fire and star fire

The Indian fire lay is the natural progression of the teepee fire. As thicker fuel is added, it is laid with one end in the heart of the fire, providing fuel, and the other ends radiating out from the centre. None of the firewood needs to be cut to size, being slowly fed into the centre as it burns. Once established, this fire will need very little care and attention other than to slide the logs into the centre. To increase the heat or build up a flame, the logs, which should only be around 10cm/4in thick at most, are stacked up on top of one another where they meet in the middle. To turn this into a low-maintenance, economical campfire in environments where a very small cooking fire is all that's needed, gradually replace your many smaller logs with four good, thick ones, all meeting in the middle. These will burn away very slowly and are thick

enough to support a cooking pot or kettle over the central heat source. This arrangement is commonly known as a star fire.

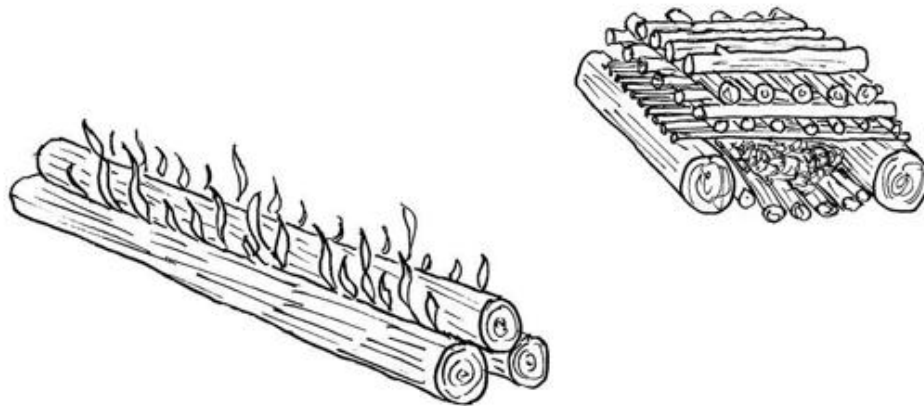
Grid fire

More stable than the teepee fire, this lay is for creating a strong, hot fire very fast, resulting in some good cooking embers. After placing a couple of logs on either side of the fire to act as foundations and prevent smothering, lay your fuel wood over the kindling as you would lay the timbers for making a wooden raft: thinnest pieces first, all lying side by side. The next, slightly thicker, layer goes straight on top to make a similar-looking raft, but laid at right angles to the first. The third layer is slightly thicker again and placed laying the same way as the first, and so you go on, criss-crossing the layers until your thickest pieces sit on top. Unless you're building a funeral pyre, the thickest pieces should still be quite modestly sized in order to burn down quickly.

This arrangement creates maximum fuel coupled with maximum airflow to get a real blaze going very fast. I use it to quickly transform a smouldering campfire into a big, flat bed of hot embers, and in these circumstances, where you already have an established fire, you don't need to worry too much about the foundation logs or increasing grades of wood, instead just building your layers with pieces of a similar size. You can add to the self-feeding effect by arranging your fire on top of a ramp of your thickest pieces of firewood. Once the fire is fierce enough, these thickest pieces, too, will burn, making the fire self-feed from below as well as above.

38. Types of fire 2

From left to right: a long fire and a grid fire ready to light.

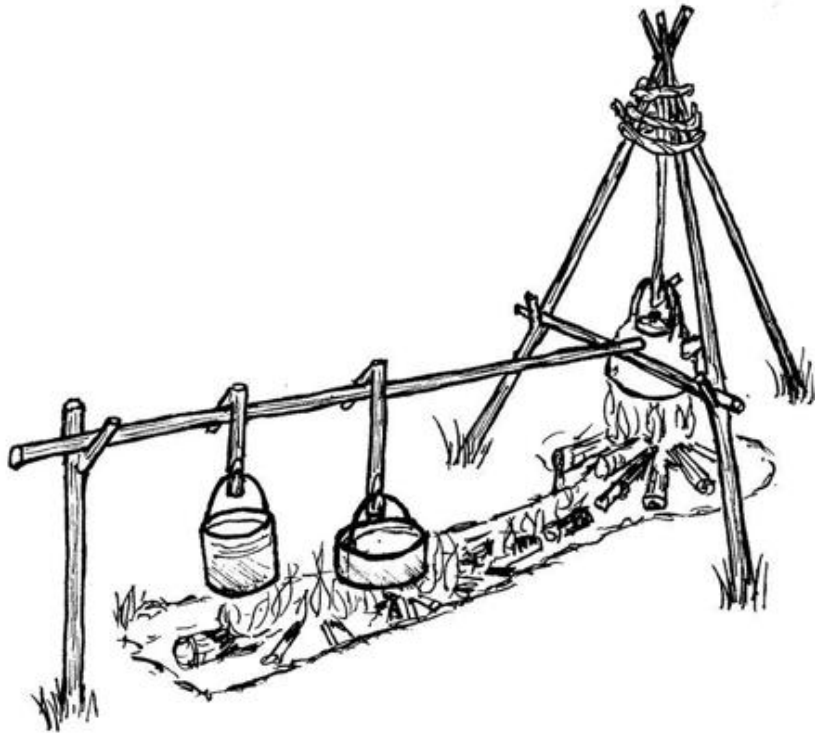


Long fire

Used to provide warmth in the coldest of conditions, this fire is one that is intentionally made to blaze away all night, warming the whole of your body as you lie on your spruce-bough bed one good pace away from it, in your open-fronted lean-to shelter. Build up a good bed of embers using the grid fire, lengthen it to almost the same length as your bed by raking the embers out, then build it up again in a similar fashion, using longer fire wood in ever increasing thicknesses on top of the ember bed. When

you turn in for the night, you should have several good-sized long logs on there, with several more to add as they burn down. Build a long fire-reflecting log wall on the other side to bounce all that heat right back into your shelter and protect it from the wind.

39. Multi-fire



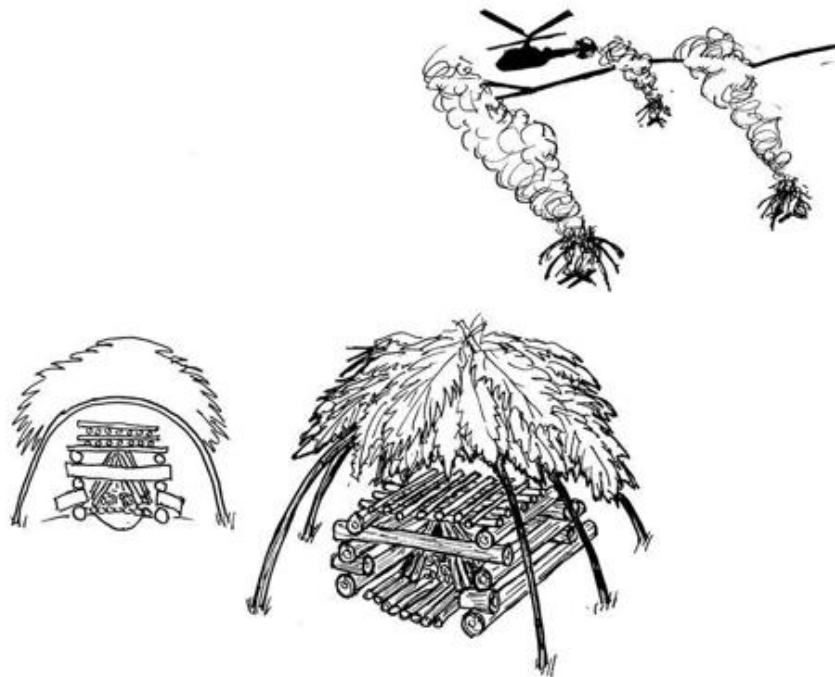
Multi-fire

A cooking fire may need to take several forms, as it is used to carry out different jobs. A good arrangement for a fixed camp is to have a circular fire pit with a good, strong fire fed by radiating fuel wood, somewhere between an Indian fire and a star fire. Above this, on a bush tripod, hangs your kettle, cooking pot or similar boiling vessel. A shallow trench, about 30cm/1ft wide, leads away from your main fire pit, into which embers are pulled from the main fire for slower cooking when required. A long rail can be fitted above the trench with various adjustable pot hangers for varying cooking temperatures.

40. Signal fire

A signal fire should be kept covered and ready to light at a moment's notice.

Three in a well-spaced triangle will make the clear distinction between a normal campfire and someone who needs help.



Signal fire

In a survival situation where rescue is needed, you can build a fire that is ready to light and burns quickly. This obviously needs to be built in an area where it will attract the attention of a potential rescuer. Lay a good ramp of logs over a shallow fire pit for good oxygen flow and build a thick teepee of kindling and feather sticks on top, leaving a gap in the middle for your tinder bundle (keep this somewhere dry until you need it). Build a log-cabin arrangement of dry sticks around your kindling teepee, ensuring you can still place your tinder bundle right in the middle when the time comes to light it up. Above the kindling teepee, supported by the walls of the log cabin, lay more dry sticks in a criss-cross fashion (similar to the grid fire).

This pre-prepared fire lay should catch and grow very fast due to having plenty of dry, well-positioned fuel and plenty of oxygen flow. Cover the whole arrangement with a mini shelter roof of dense green foliage to keep it dry.

Your aim is to provide a beacon that contrasts with your surroundings, so:

- If in a high exposed area surrounded by dark forest below, or in low light, bright flames might be best.
- If you need to send a rescue signal up through the dark forest canopy, allow the green foliage roof to burn and add plenty of further greenery to create white contrasting smoke.

- If surrounded by a vast, light-coloured environment, such as the desert, dark smoke is best, and rubber tyres are perfect for this.

If you have enough resources, build three signal fires in a well-spaced triangle to make a more obvious signal.

TIDYING AWAY A FIRE

At this stage, give some thought to what will happen when you move on. A fireplace should never be left as it is. For starters, leaving a fire of any size unattended is a potential forest fire waiting to happen. Also it's a sign of an inexperienced outdoors person. Have a tidy-fire strategy in place by deliberately holding back on fuel wood after a certain time, so that the fire burns itself out to ashes. If you can't do this, then all your half-burned logs must be doused with water until cold. If your fire has been burning continuously for several days, the ground underneath will be extremely hot and will need a lot of water to cool it down. However, hopefully your fixed camp will be pitched near a water source, and so this will not be a problem. Saturate the ground and turn over the soil to ensure that any hot spots have been well and truly extinguished. Once the soil is completely cool to touch, the fireplace can be raked over and hidden from view again. If you love nature and being surrounded by trees, then walking away and leaving a smouldering fire pit must bring about a haunting worry similar to that of wondering whether or not you left the gas on when you left for work.

METHODS OF IGNITION

As you can see, being able to create enough heat to ignite your fire is somewhat overshadowed by the painstaking preparation required to successfully nurture and grow that spark, tiny flame or glowing coal into a fire. However, being able to produce that heat is a potentially life-saving skill. In a real emergency, where your and others' lives are dependent on a warming fire, you must always use the most reliable, foolproof method available to you. Are there smokers in the group who may have matches? Or have you got a cigarette lighter winking at you from inside your pocket? We'll start with the obvious ...

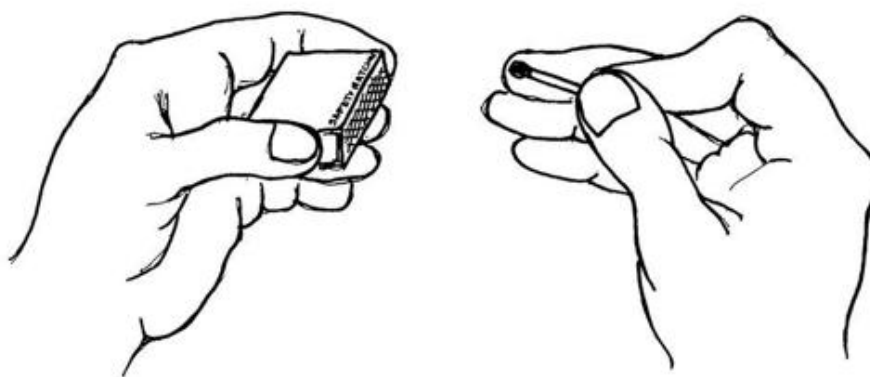
Matches and lighters

If you happen to have either or both of these with you in a survival situation, happy days! For travelling through wild places, you should always carry some matches, but replace the cardboard box with a waterproof plastic tub. Keep the rough striking section in a little plastic bag attached to the outside with a rubber band; or, even better, glue a piece to the lid. Purpose-made match safes will already have a striker attached. If you happen to be particularly macho, you could use your chin stubble! Include some cotton wool to prevent the matches dangerously rattling around in the pot (you can also use the cotton wool as tinder should you be unable to find any natural alternatives).

Matches kept purely for emergencies can have candle wax melted onto the heads for extra water-proofing. I like the red-tipped strike-anywhere matches, but windproof and waterproof 'lifeboat' or 'storm' matches are good, too, if you're familiar with using them. Make sure that as you light the match you make your own body into a shield by turning your back to the wind and that you're as sheltered as you can possibly be. Hold the match as near to the head as possible to lessen the chance of it snapping in half as you strike. As the match bursts into flame, shelter it further still by cupping it in your hands until it's right amongst the tinder doing its job. I always carry a plastic, screw-top tub of matches and a disposable lighter in a resealable plastic bag with my tinder pouch. Be wary of some types of flashy lighters that require regular re-fuelling: You can bet they'll be empty when you need them most. I've never been let down by my cheap, disposable option (but it is for emergencies, not regular use).

41. Lighting a match

Ensure your matchstick doesn't break as you strike it, by supporting the head with a finger. Just don't forget to remove your finger as the match lights!



Firesteels

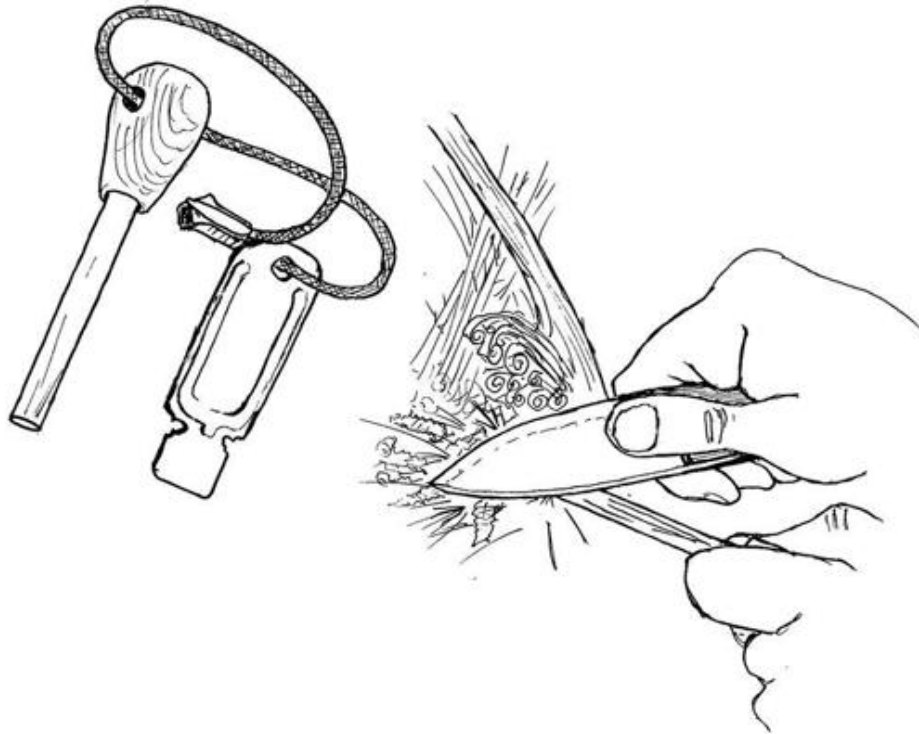
These are one of those rare items of survival kit that do actually get used regularly! Referred to as a 'flint' or a 'firestriker', a firesteel is actually a rod of pyrophoric alloys known in the trade as Ferrocium. When struck or scraped with a hard sharp edge, tiny shavings fly off, igniting on contact with the air to become extremely hot sparks.

Although different versions of this survival tool have been in use for some time, the most recent models truly are excellent. Spewing forth a shower of 3,000°C/5,430°F sparks with every one of the 12,000 or so strikes they produce, they even work in the wet. Sparks of that quantity and quality can readily ignite most tinders described above, from cotton wool, seed heads and shredded bark to dried fungi, fatwood and finely carved feather sticks. You will need to practise with one, though, as a poor technique will produce poor sparks. Long, meaningful strikes aimed at the base of a pile of tinder, rather than short, stabbing movements aimed in the general direction of the fire, are definitely the way forward. Always carry one about your person when out in the wilds as they can also be used to ignite a gas stove – easier than fumbling about with matches. Some bushcraft knives may well have a little firesteel holder sewn into the sheath, meaning that these two ultra-important bits of kit are always

together, faithfully by your side. I have a mini version permanently attached to my keys, which gets used regularly. One word of warning though: if you get a thorough soaking, make sure you remove it from any wet kit and wipe it down, as it will degrade if left damp and unable to dry out.

42. Striking a firesteel

Left: An 'army'-model firesteel with striker. Right: The back of a knife can also be used in place of the striker. Aim your sparks at the base of your tinder.



Ye olde flint and steel

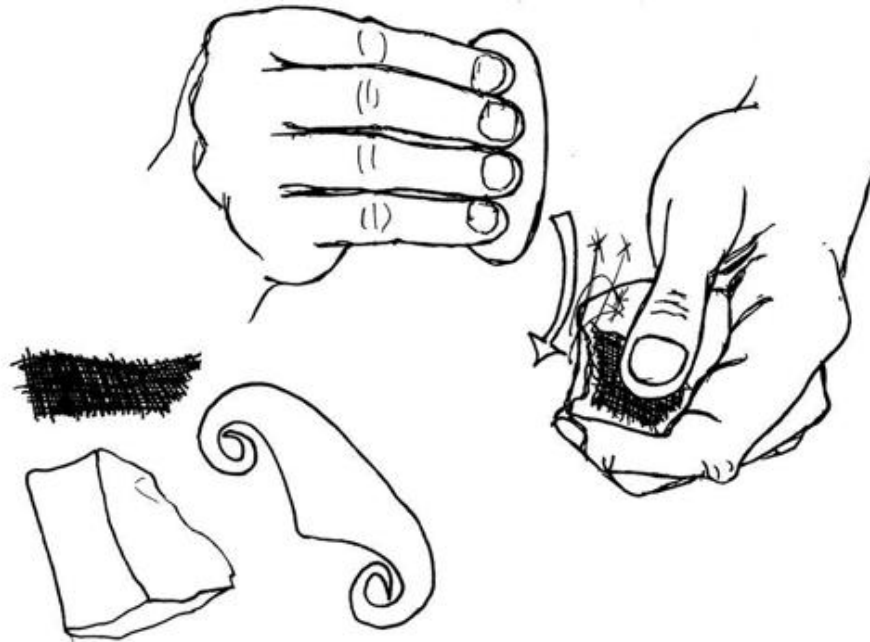
Popular with anyone born before 1826, this method produces a spark by striking a piece of sharp flint, quartz or similar hard rock with a glancing blow from a carbon-steel object. The steel striker is brought down in an arc with one hand and should just catch one of the sharp edges of the flint as it passes. The sparks are actually tiny shavings of the steel removed by the flint, with the iron content glowing red-hot on contact with oxygen. A piece of char cloth or dry fungus is held with the thumb against the top side of the flint, roughly where the sparks land. As soon as one of the sparks takes a hold (you should see it hit the tinder and stay alight, then grow brighter), stop striking and start gently blowing it to increase the heat. When the tinder is happily smouldering away, introduce it to your tinder bundle and blow it to flame.

In an emergency, you might have an old-fashioned penknife or other carbon-steel tool that could be just the job if you're in close proximity to hard, sharp rocks. An extremely ancient method that could possibly be available to you is to use flint and iron pyrites. This mineral, also known as fool's gold, can sometimes be found alongside flint looking suspiciously like a little lumpy gold nugget. The outside will

often be rust coloured, but break it open and inside you will find a metallic-coloured surface, which can be struck with flint to produce very low-temperature, orange-coloured sparks. These must be caught in a piece of super-dry and fluffed-up amadou from the horse's hoof fungus.

43. A traditional flint and steel set with char cloth as tinder

Bring your striking hand down in an arc and aim to glance the flint as you pass. Watch closely for a glowing spark to land on your char cloth.

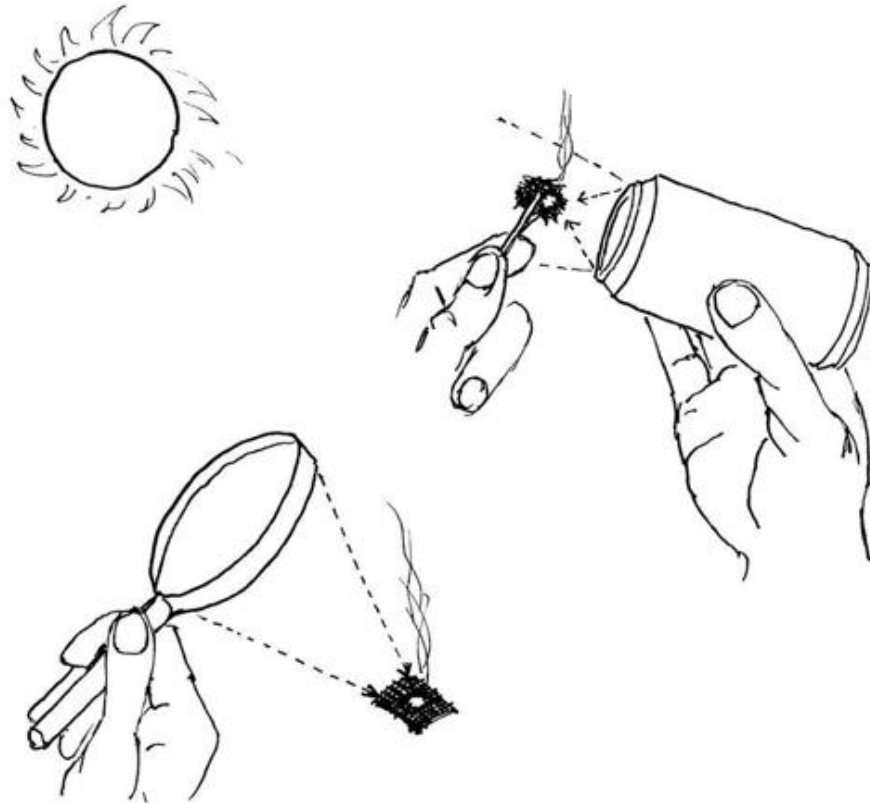


The sun

That big, hot orange ball in the sky can be used in a number of ways to produce fire. Firstly, the sun's rays can be magnified by using a lens such as the little magnifying glass on a compass baseplate, a pair of spectacles or the bottom of a glass bottle. Focus the resultant white-hot dot onto some tinder material, such as dried fungi or dung, and watch for the smoke. The sun's rays can also be reflected using a parabolic mirror to focus them onto a piece of tinder in the same way. In the absence of a purpose-made gadget, the concave bottom of a soft drinks tin can will do the same job if highly polished up with a fine abrasive such as toothpaste or even chocolate! Obviously, you need to be somewhere very hot and sunny to make this method work.

44. Using the sun to light tinder

Move the magnifying glass or concave reflective surface back and forth until you have a tiny pinpoint of light focused on your tinder. If the sun is hot enough, you'll have a glowing ember in no time.



Electricity

If you have some very fine wire wool or a Brillo pad, even quite a small voltage can be used to make fire, such as the battery from a head torch or a mobile phone. Just stretch the wire wool across both terminals and it'll start to glow red-hot. Then, as quick as you can, surround the glowing wire wool with dry tinder and blow to produce a flame. In a real emergency, you would have to weigh up the likelihood of ruining your best chance of calling in a rescue against the need for a fire.

The battery in a vehicle can also be used in the same way, and also the headlights, taillights or brake lights. Just gently break the glass bulb, being careful not to damage the filament inside. Be ready with your tinder (maybe a field dressing from the first-aid kit, split open and fluffed up) and turn on the lights. The filament will glow red-hot for a couple of seconds before disintegrating. Surround it with buffed tinder and be ready to transfer that split second of red-hot wire into your tinder.

Fire by friction

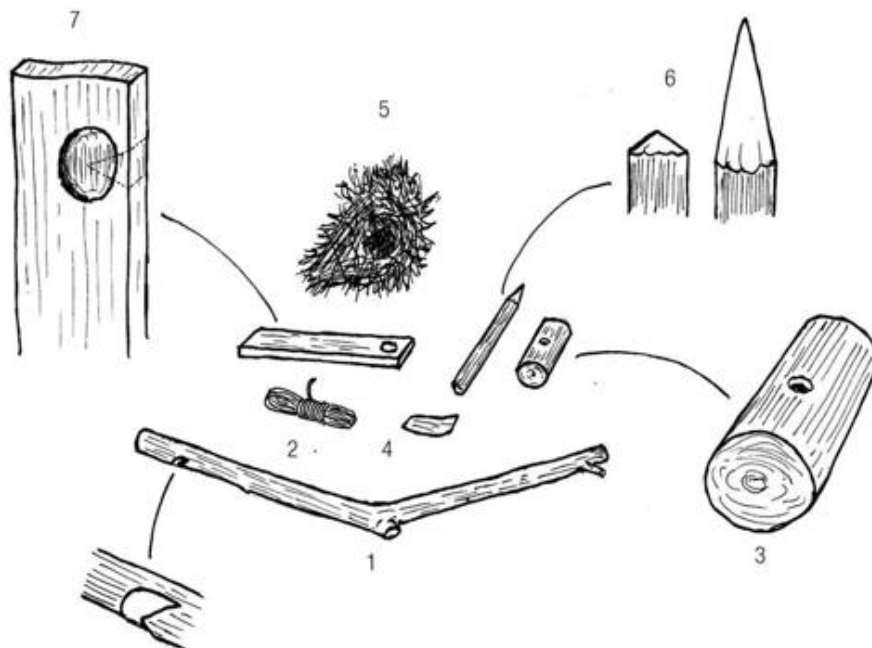
The first time you create fire by the simple act of rubbing two sticks together, it feels as if you have been given some kind of bushcraft promotion, presented with an important key or shown a secret handshake that allows entry into an exclusive club. To master this most primitive of skills will definitely be a turning point in your life.

However, while gaining proficiency in this technique, you will soon realize that it's actually far from simple or primitive, and instead requires an in-depth knowledge of different trees and plants, nature's available resources and a real understanding of the concept of fire and how to produce it.

There are several ways of achieving fire by friction, all based around the same principles, the variations very dependent on local materials and climatic conditions. Your two pieces of wood can be frantically rubbed one against the other, in line with the grain, eventually forming a burnt trench in the wider piece. This method is known as the fire plough. Or they can be rubbed across one another at right angles, known as the fire saw. Probably the most well-known method involves the rapid rotation of a long, thin spindle between a pair of gnarled, calloused hands into a hearth board. This is known as the hand drill. All the above are perfectly valid and achievable techniques but do require perfect materials, ideal conditions and faultless form.

45. Parts of the bow drill

1 Bow, 3 Bearing block, 5 Tinder bundle, 7 Hearth board
2 Cord, 4 Ember pan, 6 Drill



BOW DRILL

By comparison, the bow-drill method may require a little more preparation but it more than compensates the user for this by creating more heat, more quickly and with less effort. This is due to the addition of a cord strung on a bow, which spins the wooden drill-piece many times more for your energy output than other methods, such as the hand drill. Because of this mechanical advantage, it is more likely to be successful in

cold, damp weather or in the hands of somebody with an imperfect technique. It was the first friction method I was taught, and I have been proudly passing on the skill ever since, just to see the overjoyed amazement on people's faces as they produce flame from a couple of bits of old wood. By learning the bow drill yourself as a fire-lighting technique, you will gain a level of competence and detailed understanding of the principles of fire by friction that can then be transferred onto other techniques, should you find yourself in the right environment.

You should only need a sharp blade of some sort to manufacture the bow-drill components, six parts in total.

- **Bow** – This can be made from green wood about 2.5cm/1in thick and as long as the distance between your armpit and your wrist. Straight wood can be used, but a slight bend is preferable. Carve a notch in each end to stop the cord slipping.
- **Cord** – You will need about 1m/3ft of strong cord. In an emergency, your bootlaces and jacket drawcords are all fair game. (If you're only practising, take some para cord with you to avoid an uncomfortable walk home in loose boots.) Plant-fibre cordage can work, but it isn't normally strong enough to take repeated attempts. Twisted animal hide is better.
- **Bearing block** – Green wooden blocks, bone knuckles, antler, stones with a drilled socket, limpet shells, even mini jam jars have been used for this purpose. Whichever you use, the block needs to be comfortable when gripped in one hand and should have a little socket carved into its underside. When using wood for your bearing block, stuff a waxy green leaf, such as holly, into this depression to create a shiny, friction-reduced surface where it connects with the top of the drill.
- **Ember pan** – Could be a sliver of wood or a section of bark and must be slim enough to slide under the hearth board and catch your charred wood dust.
- **Tinder bundle** – All buffed up and perfectly prepared, ready to accept a glowing ember.
- **Drill** – Both drill and hearth board must be made from dry, well-seasoned, standing dead wood, which should be still firm and good to carve, not yet powdery. Don't use a log from the damp forest floor – it must be dry. They can both be carved from the same type of wood, but you could also mix and match. The softer hardwoods are best, such as lime, sycamore, alder, willow and poplar. Hazel makes an excellent drill in conjunction with these hearth-board woods. (Other woods will work but may require a slight alteration to your technique. For example, resinous woods such as pine can work if a little sand is sprinkled into the socket where drill and hearth board meet, creating more friction. If you try to use oak, you will certainly be warm – but through physical exertion rather than from a blazing fire!)
- Carve the drill to a length of around 25cm/10in and a diameter of just under 2.5cm/1in, with a point on each end and a round cross-section. The top should be sharply pointed to create a tiny surface area where it is held by the bearing block, minimizing friction. The bottom of the drill must have a blunt point to ensure that a wide surface area is in contact with the hearth, making as much friction as possible. Whilst you are looking to achieve a rounded cross-section in

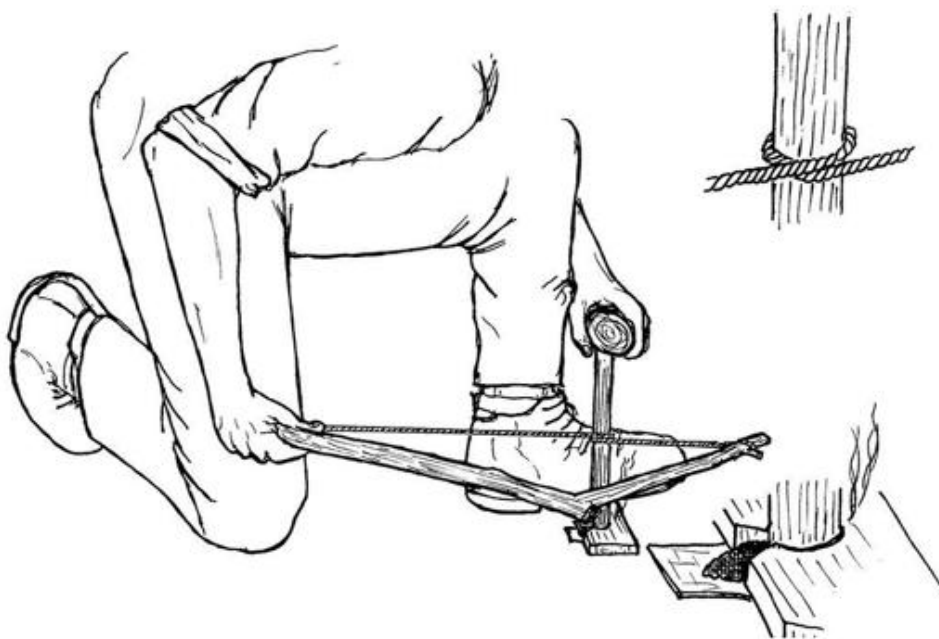
your drill, don't be too much of a perfectionist and carve it too smooth: a rough finish helps the cord to grip better under pressure.

- **Hearth board** – Your hearth board should be about 25cm/10in long, 5cm/2in wide and about as thick as your thumb. If you find a piece of standing dead wood with a nice, straight grain, a blade and batten can be used to split the wood almost down to the desired dimensions, which means you'll only need a bit of carving to flatten off the base. Carefully carve a little pinpoint depression into one face of the hearth board, roughly central on its width and about a third in from one edge. This is for guiding the blunt point of the drill as you begin to bow. Once made, keep your hearth board and drill somewhere dry and off the forest floor until you need to use them.

46. Using the bow drill

Note that the bow cord is kept horizontal and central on the drill.

The right leg is tucked back out of the way and the left hand is clamped tightly against the shin to prevent any wobble in the bearing block. As you bow back and forth, black powder (char) collects on the ember pan placed under the hearth-board notch. This char, once hot enough, becomes a glowing ember.



USING THE BOW DRILL

Whenever I demonstrate the bow drill, I always start by stripping off a few warm layers. As I look up, all I can see are worried-looking faces staring back at me from the group of lucky souls about to attempt the skill immediately afterwards. But there's no getting away from the fact that rubbing two pieces of timber together in order to eventually create a glowing coal is hard graft. Everyone develops their own ways of making the process easier, though, and once you've had a few successful attempts, these will become clearer to you.

First, attach the cord to your bow with a knot that can easily be undone for adjustment. The cord should be slightly loose rather than taut like an archery bow

string. You should only just be able to twist the cord one turn around your drill. The easiest way to do this is to lay the drill alongside the cord, rotate it slightly to overlay the cord and then twist it round to bring it vertical to the still-horizontal bow string. This wraps the cord tightly around the drill. Ensure the blunt point faces downwards. If the drill twists in too easily, you may have to re-tie your cord a little tighter.

Assuming a right-handed operator, kneel down on your right knee only, using your left foot to clamp the hearth board (pinpoint depression uppermost) steady on the ground just to the right side of your foot. Locate the blunt point of the drill into this depression, and, holding the bearing block in your left hand, locate the sharper drill point into the socket on the underside of the bearing block, thus clamping the drill in a vertical position. Your bearing-block hand should be held tightly against your left shin to keep everything locked in place, otherwise you'll expend a lot of energy just trying to keep the whole apparatus steady. The drill must already be twisted into the bow string, and with a back-and-forth sawing action while bearing down slightly on the block, the drill should spin freely as you bow. This repetitive movement will spin the drill into the hearth board, creating heat through friction. As long as you're bowing fast and hard enough, the point where drill and hearth meet will start to smoke as both wooden surfaces begin to char and consume one another. But don't get too excited yet! When the drill has burnt a little charred socket in the hearth board of the same diameter as itself, stop and have a rest.

You will find that all around the blackened socket burnt wood dust, or 'char', has collected. This is the magic dust that eventually becomes an ember, and in order to catch it and keep it hot, a notch must be cut into the hearth board. Using a sharp blade or small saw, cut a triangular section from one side of the hearth board, the apex of which extends into the centre of your burnt socket.

Once sufficiently rested, get yourself back into the same awkward position, replace the waxy green leaf in the bearing block (the previous leaf will probably have disintegrated), tighten the bow string (which will probably have stretched a little) and slip the ember pan between hearth and ground right under the notch. Then take a few deep breaths and begin to spin the drill in its socket again by moving the bow back and forth. Pace yourself at this point, conserving your energy. Concentrate on keeping a regular, smooth action with just the right amount of downward pressure: too much and the drill will bind, or stick, in the hearth, causing the cord to slip; too little and your char (if you manage to produce some) will only be brown in colour and nowhere near hot enough. Keep the bow cord running centrally between top and bottom of the rotating drill, and apply more tension to it, if needed, by pinching the cord tighter against the bow with the fingers of your bowing hand. Use the full length of the bow to give a maximum number of revolutions for your energy output. You should see smoke and char very soon. (If not, you may need to apply more pressure to the bearing block or pick up the bowing pace.)

By now you will have realized that any fire-by-friction technique requires some fitness and perseverance. In a life-or-death situation, don't try to be a hero by shouldering the burden of creating fire alone: instead, increase your chances of success by adapting the bow drill so that two people can use it. By using a slightly bigger bearing block, two people can work on the same bow-drill set, facing each other: one pulling as the other pushes, working in tandem. Many hands make light

work, as they say, and you'll have a higher chance of creating that elusive ember with a willing and able team mate.

Most of the hot, black char should now be collecting on your ember pan inside your notch cut. As the smoke increases and thickens, your notch should completely fill with char. In damp conditions this could take a while, but in good conditions with a perfect technique you should be at this stage after about 30 seconds of quality bowing. Remember that there are 101 reasons why this technique might not have worked. If your ember attempt isn't immediately successful, work out what needs tweaking and keep at it. You may need to reduce the friction where the drill sits inside the bearing block by sharpening the point and adding another waxy leaf, or the cord may be slipping and need to be re-tightened. However, if thick, acrid smoke is being produced and your ember notch is spilling over with jet-black wood dust, dig in and increase the pace considerably for a sprint finish. Thirty good fast strokes should ensure that your little mound of hot powder grows hot enough to glow red-hot in the middle.

Once you get to this stage, stop bowing and carefully roll the hearth board away to leave your miniature volcano intact. It should continue to smoke if it's hot enough inside. While protecting the fragile ember from any gusts of wind (and trying not to sneeze or cough), gently increase the flow of oxygen by slightly fanning with your hand, and you will see it glow red as it gradually solidifies into a hot little coal. Once it's strong enough, tip it into the middle of your tinder bundle and blow it into glorious flame as previously described. Now sit back and enjoy the moment. Life will never be the same again!

HEALTH AND WELLBEING

Finding water and staying healthy

To enjoy the outdoors and also stay on top form, we must understand what factors are important for our continued health. It is important that we know what our bodies need and how they should be protected.

WATER

To stay healthy, we must closely monitor our water intake and ensure it comes from a clean source or can be effectively sterilized to make it fit to drink. Any water we ingest, including any used to wash food or clean eating utensils, must be clean and free from disease. In a survival situation, after your immediate safety has been secured and shelter has been sought, water must be your next consideration.

Water is almost as essential to us as breathing. We are virtually just flesh containers filled with the stuff, and need to take in around 4 litres/7 pints in normal conditions every day. Water is needed for just about everything we do but is especially important for maintaining a clear mind, regulating our delicate body temperature, removing waste products from the body and processing and digesting food, which, in turn, provides us with much-needed energy.

It is stated in the 'survival rule of threes' that we cannot survive for more than three minutes without air, three days without water and three weeks without food. Whilst in theory that rule appears to give us a couple of days to get our act together with regards to locating a source of water, the grim reality is that even after just one day without drinking water, working at a steady rate in a temperate climate, you will begin to feel the debilitating effects. Thirst, headaches, nausea and generally feeling awful start you off on a slippery downhill slide that becomes harder to rectify the longer it is left unchecked. If your hydration levels are not restored very quickly, you will experience dizziness, cramps, deterioration of limb function, reduced hearing, failing eyesight and eventually coma, followed by death. Actual numbers of days become irrelevant here, since your overall condition, the surrounding environment and your ability to make the correct changes to your condition will determine whether you live or die.

It is important to note, however, that almost all the stages of dehydration are reversible (although the latter ones will require medical assistance, and no one has found a cure for the last symptom yet). If you are dehydrated and find a source of water, don't gulp it down. Instead, warm it in your mouth before swallowing it in small amounts, or you could lose more liquids by vomiting. (If you are giving water to a dehydrated person, make sure they follow these rules, too.)

Add to all this the possibility that in a survival situation you may be on the verge of dehydration or sickness before a lack of water even becomes an issue, and it

becomes clear that we must consider our watery needs long before we are in danger of running out, and certainly before we start to feel thirsty.

Planning your water needs

Any trip involving time spent away from a convenient and reliable water source must involve some detailed planning. With water so freely available to most of us with the turn of a tap, this basic need is easily overlooked and not given the consideration it deserves. Its carriage and future procurement should be second only to your clothing and shelter requirements when packing your kit (not forgetting a good cutting tool, of course). If you have the time to plan and organize your trip, then careful thought must be given to how much water is required daily. This is largely influenced by the temperature and environment you will be travelling through and the workload you can expect to have. In hot climates you should allow for a minimum intake of 10 litres/17 ½ pints of water per day, possibly more, depending on your intended activities. Even in a temperate climate, with a lower expected requirement of 4 litres/7 pints per day, this will probably mean at least one, probably two, stops to replenish stocks every day. Therefore, you should plan your routes carefully to include opportunities to restock from local resources, building in a 'plan B' if you can't complete the distance between water stops in the time available. Think about the types of water sources you're likely to encounter and whether you'll have the right water-gathering and purification equipment to make effective use of them.

Conserving water

Pay close attention to conserving water wherever possible. However, don't get the wrong end of the stick and confuse water conservation with rationing your water supplies. You must maintain a certain healthy level of hydration, so aim to replace and replenish your stocks rather than restrict what you take into your body. Check your urine as a useful guide: light yellow is fine, but any darker and you'll need to drink a bit more. If it's pink, stop eating beetroot! You also need to know and understand the many different ways in which water is wasted.

PERSPIRATION

Excessive perspiration can rid you of very large amounts of water and is a significant problem in any environment, hot or cold. For this reason you should always consider your clothing choice. Keep skin covered with light cotton clothing in the heat to avoid moisture loss through evaporation; and, if possible, work only in the cooler parts of the day, resting up in the shade at other times. In cold climates, strip off a few inner layers when generating extra body heat through hard work, but always aim to keep a windproof layer on, if possible, to avoid cooling too rapidly when you stop.

DIURETICS

Certain drinks, such as coffee and alcohol, will cause you to urinate more than normal and are no substitute for clear water.

BREATHING THROUGH YOUR MOUTH

Moisture is lost with every breath through your mouth, especially in hot climates, so try your hardest to breathe through your nostrils and keep your mouth shut. One recommended method of ensuring that you don't breathe all your moisture away is to suck a small pebble. But, having tried this, I will say that you have to use every ounce of your concentration to avoid accidentally swallowing it!

Carrying water

Water is heavy, at approximately 1kg/2 ¼lb for every 1 litre/1 ¾ pints, so you won't want to carry too much of it. Instead, carry the means to replace your water stocks easily and a collapsible water-storage container for situations where you may need to carry a little more. There are many different carriage methods available, but my advice is to go for the hard-plastic 1-litre/1 ¾-pint bottles with a wide mouth and screw-top lid. These normally fit snugly inside a metal mug for easy packing. Flexible bladders with drinking tubes secured near your face are advantageous, in that they encourage you to drink regularly and fold down flat when empty, but they aren't easy to clean out and can suddenly run dry without warning; also, the drinking tube will freeze solid in cold conditions. A large-capacity collapsible water bag takes up very little room and is useful for stocking up when you pass a good water source. Get a big one, as they don't necessarily need to be filled to capacity when carried but will provide extra storage when required. The waterproof bags that have been keeping your kit dry can also be used to hold an unbelievable amount of water in an emergency.

Where to find water

If you have the luxury of being able to plan a trip, then water sources should be fairly easy to plot with the help of a map. Rivers, streams, lakes, springs – even small ponds and marshes – will all be clearly shown, and with experience of how various landforms are represented on a map you should be able to determine the likelihood of areas that might contain an emergency source. In more remote areas you may need to back this up with some reliable local knowledge. The next best thing to a map in a non-planned situation is to make use of any high ground from which to study the landscape for clues. Other than obvious bodies of water, look for valleys, the base of large land masses or cliffs, where water will have naturally drained downhill, and certain types of vegetation that may indicate its presence, such as reeds, and willow or alder trees. In dry landscapes the presence of any vegetation at all should be a dead giveaway. Bees will always be fairly close to water, as will midges. Finches need regular top-ups, being grain-feeding birds, and low-flying pigeons in the morning could lead you to a source. You could also try following an obvious animal run if it looks very regularly used, especially by lots of different species.

SOURCES AND COLLECTION

Keep an open mind with regards to the source of water you expect to find. A stagnant pool or muddy patch of ground may not look all that thirst quenching, but there are many methods of making the water fit to drink. However, you must definitely avoid sources that look as if they may be contaminated by chemicals or other forms of pollution. Dead vegetation and suspect scum on the surface are a telltale sign. Even a crystal-clear bubbling brook has the potential to hide a dead animal further upstream. Most of the sheep in Wales seem to have as their last dying wish an inbuilt desire to hurl themselves into the nearest stream. Always inspect your chosen source well.

Rain

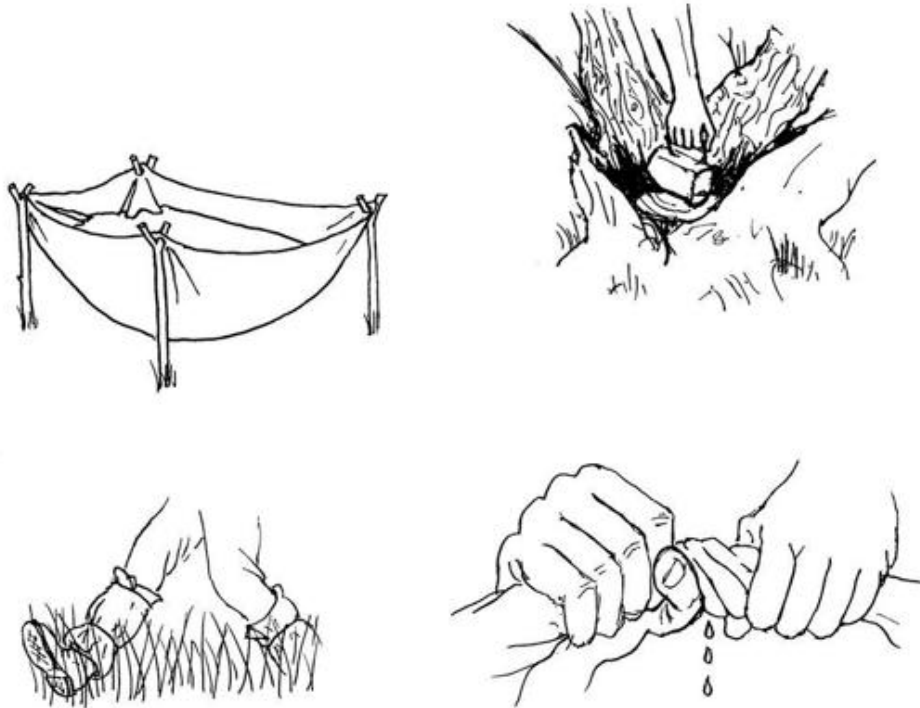
In most areas the rain will provide you with a pure source of water. Set up a tarp to catch as much of it as possible. If you use a tarp or tent to sleep in, then rainwater collection will be a valuable byproduct of its use, and in wet weather you should always collect those annoying noisy drips. Provide a low point to channel the water by tying a corner down to a stake or weighting it down with a clean rock. Leave a container under the drips to fill with water gradually, but check it regularly: in a real downpour it'll fill very quickly and in really wet conditions you'll build up a good reservoir in no time at all. Make sure your tarp is clean and not coated with a waterproofing solution that could taint the water; and always check the tree canopy above for toxic plants that the rain could be filtering through. In the absence of a tarp, a survival bag or any piece of waterproof material of any size can be used to catch the water, although obviously the bigger it is the more rain you'll collect. Large leaves can also be used, even the carefully thatched roof of your shelter should channel rain to a point where it can be collected.

Sometimes you'll find a mature tree with a natural hollow where the large trunk separates into two or more thinner trunks. These 'tree wells' will frequently be filled with water channelled down the bark of the huge trunks, although it's normally filled with decaying leaf matter and tannins leaching out from the tree and doesn't smell too good. If you scoop out the old sludge just before a heavy downpour, you'll stand a good chance of collecting a fair quantity of good water in the well. They can sometimes be as deep as your forearm. Scoop it out and filter it pretty quickly before it becomes tainted by tannins from the tree, and don't try it with a known toxic tree such as the yew.

47. water collection methods

Top left: A waterproof tarp used to catch and hold rainwater. If you have more than one tarp, set them up to provide a huge surface area that catches and deposits every single drop into a reservoir tarp.

Top right: water being bailed out from a tree well.



Bottom right and left: an alternative to mopping dew up with an improvised mop. Tie absorbent clothing around your lower legs, go for an early morning walk in the tall grass and wring out the moisture into a container!

Dew

First thing in the morning and late in the evening, grass and exposed vegetation are covered in water, albeit tiny droplets. These can be absorbed with a clean item of clothing and wrung out into a container. Sounds like a lot of work, but walking through long grass just before the sun comes up, dragging an absorbent piece of material on a stick will produce quite a lot of water. Dew will also collect on any cold surface, so smooth rocks can be collected and placed in a plastic-lined shallow pit to attract moisture, which then dribbles down into the bottom of the pit. In a hot climate, you'll need to make use of this moisture before the sun comes up or it'll be gone again. Much larger dew ponds, following the same principles, have been used to provide a self-sustaining water source for livestock on high, chalky Sussex downland in south-east England for centuries.

Trees

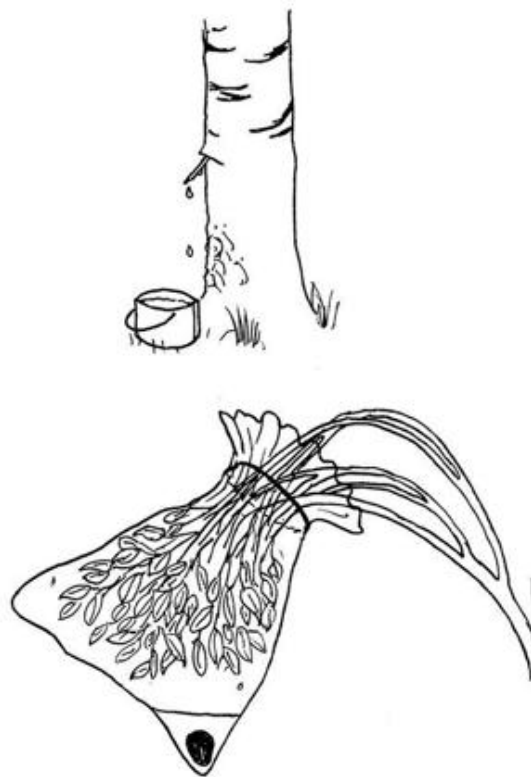
In the winter, trees pretty much shut down and go into a stage of dormancy until the spring, but once the sap starts flowing again there are some that can be tapped. Silver birch, in particular, can provide an emergency drink during a 2- to 3-week window in early spring. Find a good-sized tree, preferably with a slight lean, and carefully use your knife and a batten to pierce a hole through the bark on the side with the lean. If the conditions are perfect and it's the right time of year (usually around late February/early March) you will see a dribble of sap appearing in the hole, which very quickly becomes a trickle, then a constant drip. If the tree has enough of a lean, the

drips should fall clear from the trunk and into a collection container. If not, you may need to fit a little protruding drip-director so that they go where you want them to. Over time, your container will fill up and provide a very slightly sugary drink that is lovely and refreshing and can even be boiled down to produce syrup if you've got an excess. (Once you've had your fill, be kind to the tree and plug the hole with a little section of wood.) The sap isn't pure enough to be used as your only source of drinking water, however, but if you're in the vicinity of silver birch then the chances are that there'll be a better source available nearby if you look hard enough.

Trees also give off water through their leaves when exposed to sunlight – a process known as transpiration. If you have a transparent polythene bag, this water can be trapped and collected. Choose a particularly leafy branch or bundle of foliage from a non-poisonous tree in a place that gets sunlight for most of the day, and enclose them within the bag. Pop a little pebble in the bag to provide a low point for the water to gather around and tie the neck up tightly around the branches. As the sun shines through the clear plastic, the leaves release their moisture, which condenses on the inside of the bag. This is a method that sounds unlikely to produce much water, but the results can be surprising. After getting good results everywhere (including in the desert) with this method, I always carry a large, transparent polythene bag in my kit, as it has to be one of the most helpful and least-expensive water-procuring items there is.

48. Sap tap and transpiration trap

Two ways of extracting drinking water from a tree. Top: Wait until spring, make a hole in a birch tree and channel the sap into a container to get a chilled, slightly sugary drink. Bottom: If you have a large, clear plastic bag, then water expelled through the leaves during the day can be caught inside the bag. A surprisingly effective method.



Snow

In cold climates you can be surrounded by water in the form of snow and ice, but it's sometimes not as easy as you think to turn that into water. Heating snow and ice requires a lot of fuel, so always look for an alternative source, if possible. Fast-running water is normally the last to freeze. Never be tempted to eat snow, due to the risk of lowering your core temperature. Melting that snow internally will use some of your own valuable body heat, not to mention the potential for developing cold-weather injuries to your mouth.

Snow can be melted in a cooking pot, but look for wet, slushy snow that's still pure white, if possible. Powdery snow contains a lot of air and might only produce a tenth of a billycan of water for your troubles. Packing the snow in even tighter might only result in disaster, as the resultant air space created by the bottom of your wedged-in snow melting first may overheat a flimsy cooking pot to the point where the pot is ruined. Ice is a better bet, containing far less air than snow and providing a good return of water per potful.

Another option is to pack a spare T-shirt or your mosquito headnet full of snow and hang it near the fire to melt slowly and drip into another container below. Make sure your headnet isn't treated with insect repellent, though. Once you have your melted water, take steps to store it somewhere warm so it doesn't re-freeze in your water bottle.

It's easier than you might think to become dehydrated in a cold climate. A high-fat and high-protein diet, common in cold climates, requires more water to break it down; but, in addition to that, you just don't feel like gulping down cold water. Make yourself a warm drink whenever you can, to warm up your insides and encourage yourself to drink more liquids. I can heartily recommend needle tea made from spruce, grand fir or pine. The softer, light green needles growing at the very tip of an easily reached bough have a high vitamin-C content and a fruity flavour. Just take your water off the boil and put a good handful of needles in to steep for about 5 minutes, like a tisane. If you boil the water with the needles in first, the valuable vitamins will be lost. Strain the needles out before drinking. This is definitely the best green tea you'll ever taste, and when it has cooled down completely it tastes like flat lemonade.

Groundwater

There may be many instances when the ground is saturated underfoot but there is no visible pond or spring. Sometimes the ground may not even feel all that damp, but the area might contain clues in the form of typical water-loving reeds, ferns and mosses growing from it, giving an indication that there's water down there somewhere! The answer here is to dig a gypsy well.

Using a sharpened stick, or shovel if you have one, dig down until water starts to seep into the bottom of the hole. Don't expect a gusher resembling the accidental fracturing of an underground water pipe or someone drilling for oil, just a slight but visible dampening of the soil in the bottom of the hole. Let the hole naturally fill with water and then scoop it all out again, as the chances are it'll be dirty. The second filling may also need to be scooped out, but the third filling should provide you with clear water. If you ensure that you've made the hole wide enough to fit your billycan or

mug inside to scoop out the water without disturbing the sides, then the water should stay clear. Refine the well by lining it with reeds or similar non-poisonous plants to act as a filter, and make a lid to keep other debris out.

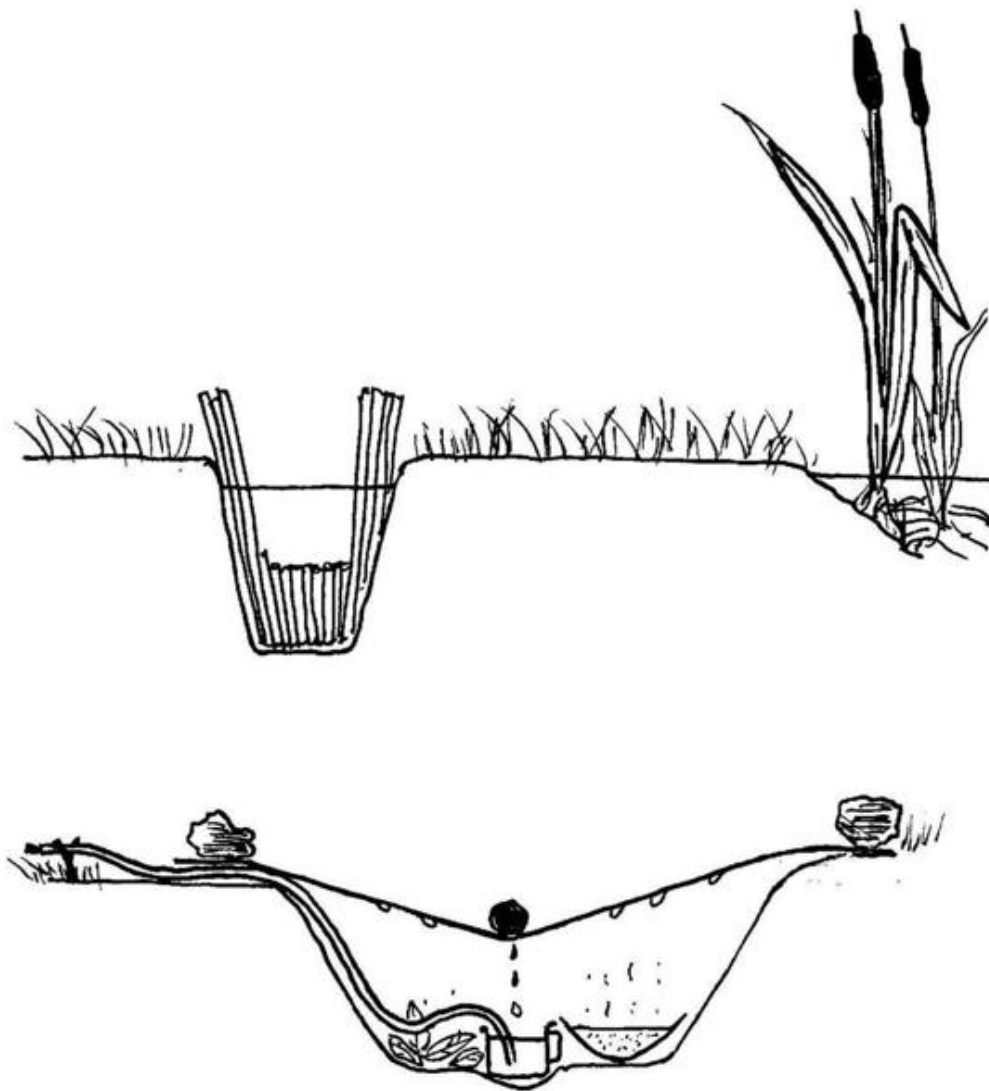
I once camped for several days next to the tiniest trickle of water masquerading as a stream. You would've had trouble filling a thimble from it, but by digging a gypsy well, with the trickle running straight in like a dribbling tap, I had all the water I needed close to hand.

Digging down behind sand dunes can also sometimes turn up good drinking water, but always test it first before drinking it, because if it turns out to be seawater, then drinking it will rapidly dehydrate you further.

49. Gypsy well and solar still

Top: The gypsy well is an excellent method of revealing a hidden water source. Line the inside with clean, tightly woven foliage to act as a primary filter.

Bottom: The solar still makes use of a large, clear piece of plastic sheeting to evaporate water from an unclear or unusable source and let the resulting condensation drip off the sheet into a clean container. A length of tubing will let you extract the clean water without dismantling the still.



Distillation

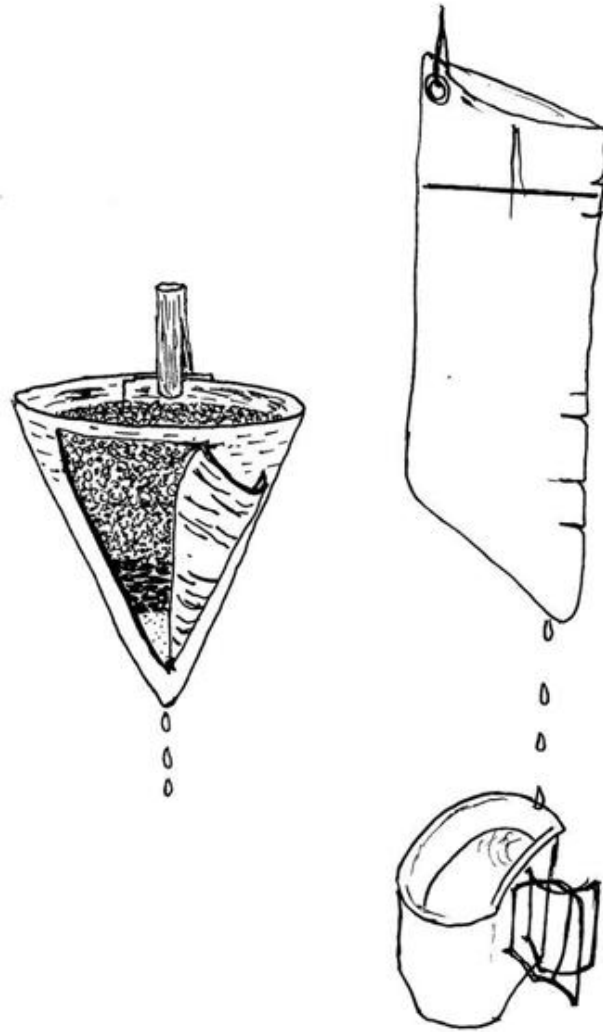
Some sources of water can only be made drinkable by distilling them, but without the proper equipment you'll need to be desperate to justify bothering. Stagnant pool water can be boiled, and the steam produced caught with absorbent clothing and wrung out. You won't get much for your efforts, but what you do get is fine to drink, believe it or not. Even seawater and urine, which must never normally be drunk in a survival situation, can be distilled in the same way.

This undrinkable water can also be distilled in the heat of the sun. Using a ready-made hole (or dig one if you have to), place your undrinkable water in a container at the bottom along with a clean, empty container. Any non-poisonous vegetation can be placed in the hole, around the edges, too, as this will also give off water through transpiration if freshly cut. Cover the hole with your faithful transparent plastic bag and secure it well around the edges. Place a pebble on the top of the plastic, right above the clean container, so that the sun beats down on the undrinkable water under the plastic bag, causing the water to evaporate and condense on the underside of the plastic, leaving any impurities behind. This clean water runs down to the lowest point of the bag (provided by the pebble weight) and drips into the clean container. Having had personal (you've got to try these things) experience with this method, I can say that it does work and the small amount of clean water is drinkable, but it still tastes like the source it evaporated from, which in this case was urine.

50. Filtering water

Far right: A Millbank bag will filter out any particles from unclean water. Let the water run through until any dirt is rinsed away from the bag's outer, then collect and sterilize the remainder.

Right: Flexible birch bark fashioned into a cone with a simple wooden peg, and packed with dense, porous materials can perform the same job in an emergency.



Filtering water

Any wild source of water that has dribbled through, under or over the ground on its way to your improvised collection device must be treated as unclean. Visibly unclean water, with detritus and plant matter clearly floating around in it, must be filtered before purification, as the larger particles can prevent chemical methods of purification from working effectively. Even slightly cloudy water should be filtered, if possible, to avoid irritating your insides. A Millbank bag is a tightly woven cloth bag into which murky water is poured. The dirty water slowly filters through, leaving behind any particles, and the resulting virtually crystal-clear water is collected in a pot to be chemically purified or boiled. If you don't happen to have a Millbank bag, then paper coffee filters are a good substitute. In an emergency, any item of tightly woven clothing made into a bag will do – trousers, shirts or socks – although most will need to be at least doubled over to be effective.

If you have no spare clothing to use, an improvised filter can be made using a roll of bark or several large non-poisonous leaves to make a simple cone into which your

water should be poured. Make the hole at the bottom as tiny as possible and pack the inside with several layers of safe natural materials that the water can drain through slowly: coarse grit, fine grit, charcoal (not ash) and finally sand at the bottom. Tightly packed non-poisonous vegetation can also be used, with a powdered charcoal layer sandwiched in between. Collect the water as it drips out from the bottom and purify it before drinking.

Purifying water

Only rainwater should be considered safe to drink straight after collection, and even then it should be viewed with suspicion. Any wild water, whether you are in a genuine survival situation or just camping out, is capable of making you incredibly ill if you drink it without first treating it to remove the invisible water-borne diseases it could contain. Tiny parasitic worms, viruses, bacteria and protozoa – such as the incredibly resilient *Cryptosporidium*, which causes anything from vomiting and diarrhoea right up to potentially fatal illness – could all be swimming around in your water. Not a pleasant prospect if you are far away from a toilet, and a serious problem if you are trying to avoid dehydration in a survival situation.

BOILING

The one method that destroys all of these nasties is boiling. Bringing the water to a furious rolling boil is enough to kill everything and provide safe drinking water. (Don't overboil, though, as you'll just be wasting good water through evaporation.) If you have a metal pot and the means to make a fire, boiling shouldn't be a problem and is well worth the effort, even if the shimmering stream you collected your water from looked sparkling and crystal clear. If you haven't got a metal cooking pot, then rocks can be heated in the fire (see 'cooking using hot rocks' on page 252) and placed into a non-metal container to boil the water from inside. If you haven't even got a non-metal container, then a hole in the ground can be lined with a waterproof coat or plastic bag to hold your water. Keep adding the rocks until a rolling boil is reached. You may need to construct a wooden ladle basket to lower your rocks into the water if your container is made from a material that could melt when the rocks touch it.

51. Boiling water with rocks

If you haven't got a metal container, then heated rocks can be placed in an improvised cauldron to boil water from the inside.



CHEMICAL PURIFICATION

There are several methods of chemically treating water to make it safe to drink, and purification tablets should always be carried by the well-prepared outdoors person just in case clean water is desperately needed and a fire simply isn't achievable. Chemicals are also often used by wilderness travellers who need to purify their drinking water on the hoof. No one method alone is as guaranteed to kill all waterborne diseases in the same way that boiling does, however. They should also not be used as a long-term solution. Boiling should be your first choice wherever possible.

Always read the instructions carefully when using any chemical method of purification, as they aren't suitable for everyone. They also have variable contact times and can behave differently depending on the environment they're used in. Always make sure that all parts of a water container that has come into contact with potentially unclean water have been treated by the chemical, in particular around the lid and mouthpiece, and clearly mark any container set aside to carry unsterilized water.

Portable water purifiers/filters

These handy little hand-operated pumps will draw contaminated water up and through a series of filters and chemicals and back out again into your drinking container, ready to drink. The filters have a limited lifespan but can be changed during a trip, giving you the capacity to purify hundreds of litres/pints of water without having to boil anything. Be wary of using them in extremely cold conditions as the internal workings can be cracked by residual water freezing inside.

Iodine

This comes in tablet or liquid droplet form, sometimes with a de-taster, as it doesn't taste too good. It needs a certain amount of time to be considered effective and can degrade, becoming less-effective if exposed to sunlight. The information supplied

must always be followed. In particular, it should be avoided by pregnant women and anyone with thyroid problems or an allergy to iodine.

Chlorine

These tablets will remind you of accidentally swallowing swimming-pool water. They are slightly less effective than iodine in chalky, alkaline water, and need to be left longer before the water can be considered safe. Chlorine is more effective in cold temperatures than iodine.

LATRINES

Of course, what goes in must at some point come out again, and you must be careful not to risk polluting your drinking-water source by going to the toilet too near it. For digging a latrine while on the move, a suitable tree to lean against and a shallow scrape is all you need, but if you have a fixed camp, then you should set up a designated toilet area well away from camp, preferably downhill from your water source and your camp in general.

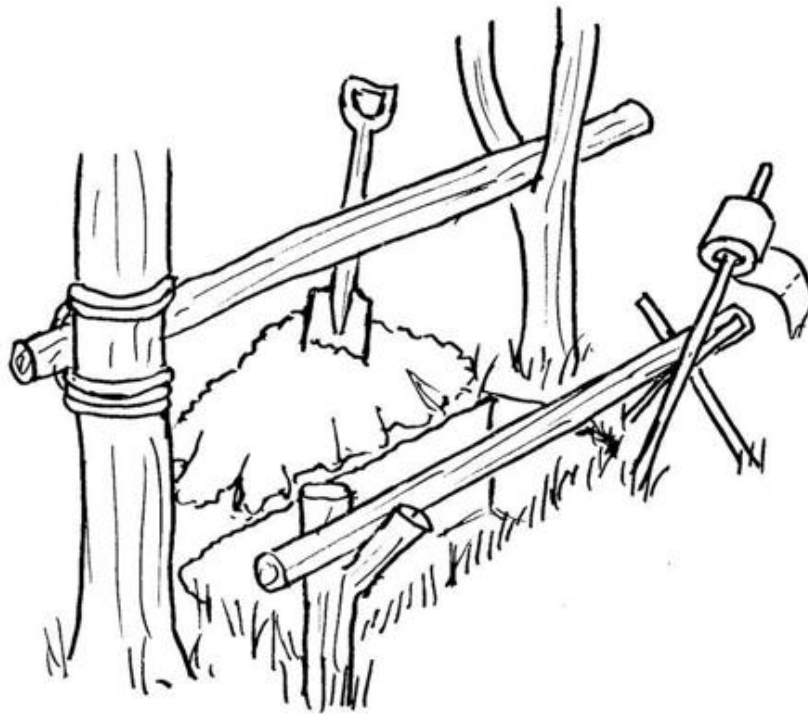
Choose a well-covered area with ground that drains well and ensure that as you dig down you haven't come into contact with the water table. If your latrine is catering for several people, dig it around 1m/3ft long, 30cm/1ft wide and anywhere between 50cm–1m/20–39in deep. Pile the soil at the side, and every time the latrine is used, scoop in enough spoil to cover the waste. Toilet paper should be burnt, if possible, but any plant matter used in its place can just go into the pit.

If you have time, rig up a smooth log bench to perch on and a backrest to lean against. A well-secured rope with a loop tied into the end is also good to hang onto and prevents anyone tumbling backwards into the latrine. Keep a good supply of toilet paper or toilet-paper substitute (moss or large, non-poisonous or irritating leaves) next to the latrine and top it up regularly. A bucket or similar container of water with soap is good to have nearby, but if that's not possible then you must take steps to wash your hands thoroughly before coming back to camp.

Despite being not much more than a hole in the ground, this is a surprisingly non-smelly and very clean group latrine, and can just be back-filled once finished with. Put two obvious sticks in an 'X marks the spot' fashion over the site of any filled-in latrine as a warning sign to others or just in case you unwittingly choose the same spot again in the near future.

52. A fixed camp latrine

Comfortable, non-smelly and often comes with a nice view.



PARASITES AND TICKS

In any outdoor environment, sleeping amongst the leaves and grass, you are going to come into contact with tiny parasites and insects at some point. Check yourself regularly, especially in those dark, warm places (you may need a close friend or a cleverly angled mirror) in which such creatures like to hide. Most of these critters just want to suck your blood and go, but they will all leave behind a tiny itchy wound, which could become infected. If you're unlucky, they could also leave you with any number of nasty diseases, and the longer they stay attached, the more likely this is, so catching them early is important.

Prevention is better than cure, of course, and you must take steps to keep them away by wearing insect repellent and topping it up daily. On exposed skin it is sometimes better to avoid washing off old layers of repellent and just keep layering over the top like a varnish. Pay particular attention to any openings in your clothing, such as trouser ankles and waistbands. Even if you keep everything securely hidden away, these tiny unwanted guests have a habit of settling on your clothes and wandering around until they find a way in, so don't assume you'll be safe just because you've got your trousers tucked into your socks.

Ticks are little black, spider-like creatures that attach themselves to your skin with the aim of filling up on your blood and dropping off again to enjoy their feast. They can carry Lyme disease and must be carefully removed as soon as possible. Using tweezers, grip them as close to your skin as possible and gently pull them out without leaving any part behind. Keep an eye on the bite even when you get home, and if a red, concentric-ringed rash develops, go to see your doctor.

If you find a leech attached to you, use alcohol, DEET, salt or nicotine to encourage it to let go, then dress the little wound.

Anyone travelling to a part of the world that's known for its persistent and dangerous biting insects and tropical diseases should make sure they take a good mosquito net to sleep inside at night (choose one that goes underneath as well as over the top, providing a fully enclosed area), and get well and truly dosed up with the relevant medication before they go.

EXPOSURE TO EXTREMES OF WEATHER

When you're at the mercy of the elements, it's important to maintain your mini microclimate and keep your body running at the right temperature. Your water intake can have a direct effect on your body's cooling and heating system. Other factors, such as general fitness, conditioning, health, injury and clothing choice, should all be taken into consideration, too. If you haven't got the right clothing or kit, you must make use of natural shelter.

Hypothermia

You don't have to be at the North Pole to be at risk from this potentially life-threatening condition. Hypothermia occurs if the body's core temperature falls below 35°C/95°F. This could be brought about by a number of contributing factors, such as wind chill, lack of food, cold and wet, tiredness, anxiety and inactivity. You must catch it early on, and in order to do that you need to be able to recognize the initial symptoms. Don't be afraid to take action even if it means cutting a journey short and finding shelter.

The very first signs are shivering, quietness and a loss of manual dexterity in the extremities, caused by blood returning to the body's core. Shivering is necessary and designed to warm us up, but it uses vital energy, which we may be low on. Take important action at this stage to adjust clothing choices, have a rest, take shelter and have a warm drink.

If these symptoms aren't dealt with, the next stages are irrational behaviour, more intense shivering, clumsiness and confusion. Serious steps must be taken here to prevent more heat loss, but at no point should the hypothermic person be made to run around or be exposed to an external heat source, as this can draw blood away from the core, where it is needed. This could be a fatal mistake! They must be allowed to re-warm themselves. Getting into shelter and climbing into a warm, dry sleeping bag (maybe even two) will help, and hot, sweet drinks should be given.

If the condition deteriorates still further, you must keep the casualty still, keep a close watch on their breathing and pulse and seek medical aid. If their shivering stops, then medical assistance is urgently required. Stop giving hot drinks or food, keep them still and protected from the elements and monitor airways and pulse until help arrives.

Heat exhaustion and heatstroke

You can overheat very quickly in extremely hot environments. Prevent the likelihood of this happening by staying well hydrated, wearing a wide-brimmed hat and light cotton clothing providing total coverage, and using sunscreen.

Heat-exhaustion sufferers will feel dizzy and be sweating profusely, with cold, clammy skin. Move them into the shade and give them fluids to cool them down. Raise their legs to improve blood flow to the brain and keep a close eye on them.

Heat exhaustion can become heatstroke. If they feel dizzy, develop a headache, stop sweating and feel hot but dry, move them into the shade quickly, lay them down with their head raised and do anything you can to cool them down. Cover them with a wet cotton sheet, remove any excess clothing and fan them, but be aware that they could lose consciousness, so monitor their breathing, pulse and temperature in case they need to be cooled down further still.

Remember, with extreme weather exposure, prevention is always better than cure, so get the right clothing, wear it properly and pay close attention to any factors that may contribute towards your first line of defence being breached.

NATURE'S BOUNTY

Harvesting and foraging for wild food

I often wonder how long it would take Mother Nature to reclaim the land if the human race suddenly vanished. The natural world seems relentless sometimes in its continual pursuit of dominance, as sucker shoots force their way through the pavement cracks and seedlings take root in the strangest of places. I'm sure that given half a chance the wildwood will spring up from underneath the thin concrete crust that covers it and we'll be back to our rightful place in the pecking order. Despite thoughts of triffids taking over the world, I think that it's comforting to anyone who enjoys plants and has some knowledge of their significance to be reminded of their perseverance and continual presence.

Wilderness or not, most of the time plants are all around us in myriad different forms. To the average onlooker this can often be a blur, like a kind of green net curtain that occasionally catches the eye when a burst of colour reveals a flower or faintly familiar fruit. To others it might just look like a bad infestation of weeds. However, someone who has developed an interest in plants and their uses has a completely different view of the plant world: they see resources everywhere, both food and tools. Even in unfamiliar surroundings they see the same familiar faces, like bumping into old friends. They know what to expect from each season, and the annual re-emergence of a useful plant serves as their outdoor calendar. A knowledge of wild plants takes your outdoor experience to another level. Nothing makes you feel part of the natural world more than including some of it in your stew. On extended trips we can introduce a bit of excitement and variety by packing only a basic carbohydrate ration, such as flour or rice, giving us the incentive to experiment with wild and seasonal gathered goodies.

From a survival point of view, we're asking a lot from wild plants as a food source. As a species, we have become used to eating a lot of easily available and fast-acting, carbohydrate-rich, sugary foods in everyday life, probably more than we ever used to when we hunted and gathered for a living. They normally make up the bulk of our diet, providing energy and keeping our engines fuelled and ready for action. When we are thrust into completely wild surroundings, such carbohydrate-rich foods aren't necessarily as easy to come by, so we may need to adapt. It is thought that our ancestors who lived from the land for real were used to periods of fasting when times were hard. They knew what to expect in terms of how their bodies would react and what their limitations would be.

However, in a survival situation our priority is to provide shelter, warmth and water before looking for food. These tasks can require a massive investment of precious energy, potentially without any coming back in the form of food. Perhaps our hunter-gatherer ancestors already had their basic needs covered and could sit tight, conserving energy, until the next edible opportunity came along? Either way, once the priorities of survival have been taken care of, we're likely to be in debt for a calorie or two.

EATING TO SURVIVE

We need a certain amount of calories per day just to stay alive. When we are in the wilderness, without proper equipment to keep us warm, and maybe a higher stress level than usual, we could be burning more calories than most people do, even when we're sitting still, doing nothing! As soon as our calorific intake dips below our calorific expenditure, our bodies start tapping into stored fuel for energy; and if this deficit is not recouped, then pretty soon we'll be on the slippery slope to starvation. The human body can switch over to food types other than its usual carbohydrate for energy, namely fats and proteins, but they're harder to convert to energy and we should expect to feel slightly more sluggish as a result. However, sluggish is better than nothing, and with that in mind we should concentrate on our overall calorie intake first and foremost, and worry about where those calories come from later on. Gathering all and any high-calorie food sources must be our first priority before we give any consideration to whether or not mint leaves will be a fitting accompaniment to our worm risotto.

With regards to exactly how many calories we should aim to ingest per day to ensure we aren't in deficit, there are plenty of factors to consider, such as our age, physical build, daily workload and the environment we happen to be in. As a very rough guide, we can assume that 3,500 kcal are needed each day in a survival situation in a temperate climate, but in cold environments with a higher workload it could easily be double that. Obtaining that amount of calories from wild food sources isn't easy, but what happens if we fail to gather any food at all? Our bodies will take what they need from our own reserves. Any stored glycogen will quickly go, if it hasn't already been used up, followed by stored body fats and finally protein, in the form of muscle tissue. Each 450g/1lb of stored body fat contains around 3,500 kcal of energy, so in theory you should get a day's worth of calories for every 450g/1lb of excess flab you carry. Hurrah for doughnuts!

The widely quoted length of time you can go without any food is three weeks. It has been known to be more in some cases, but can also be less. The reality is that it doesn't take many days without food to notice a big drop in your energy levels and ability to make good decisions. Like falling dominoes, this in turn impacts on almost every survival task we undertake, so we must make every effort to gather plants that give us a good return of energy. In order to do that, however, we should understand where the energy comes from.

BREAKDOWN OF AVAILABLE NUTRIENTS

These food groups and nutrients are all important in their own right and can all be obtained from plants foraged from the wild.

Carbohydrates

These are our bodies' food group of choice for supplying us with energy. They are easily absorbed, stored as glycogen in our muscles and liver and can be accessed

quickly for energy, both fast intense bursts and more long drawn-out activities. Our brain draws glycogen from the liver as its primary energy source, so carbohydrates are important for keeping us fit mentally, too. Carbohydrates also need less water in the diet to break them down into energy, which means fewer water runs and less firewood to boil that water in order to make it safe to drink. However, our bodies have a limited capacity to store carbohydrates. What's stored in the liver and muscles isn't much – about 1,500 kcal worth (or enough to last you half a day) – then it needs to be replaced from our food. Any excess taken in that cannot be stored gets converted into stored body fat. This stored fat can also provide us with energy, but can only be accessed when we aren't able to take in enough carbohydrates.

When the body is burning carbohydrates for fuel, we can be a bit 'up and down'. It's pretty obvious when we're not getting enough, as our lack of energy speaks for itself. We can also get depressed, be unable to focus on a task and even suffer from visible shakes and light-headedness.

If you're gathering and eating plant foods, you'll most likely be getting some carbohydrates, as they can be found in roots, grains, nuts, greens, fruits and seaweed. We must aim to take in as many as we can to maintain our energetic outdoor existence, but although there are thousands of different useful plants out there, and among them are plenty of wild foods, there aren't all that many that contain the amounts of carbohydrate that we are used to. Luckily, we can get by with lower than normal amounts of carbohydrates in the diet and still feel pretty healthy. Just 125g/4 ½oz of pure carbohydrate per day is thought to be an acceptable amount. (As an example of what that might look like through the eyes of a wild-food forager, it roughly equates to five average-sized burdock roots.) To be feeding yourself sufficiently well to be thriving and not just surviving, you'll still need to find the rest of your daily calories from fats and proteins. In real calorie terms, that'll be five squirrels or one small salmon per day. Better read the next two chapters and get those traps ready!

Fats and proteins

Meat and fish are the best source of good-quality fats and proteins in the wild, though both can be found in plant foods too. Fat is the next best thing to carbohydrates for energy, as far as our bodies are concerned. Fat also has the advantage of having just over twice as many calories per gram/ounce as both carbohydrates and proteins, so is an obvious choice for maximizing the calorie count in a survival diet. Nuts and seeds contain a considerable amount of fat.

Plant proteins can be found in nuts, grains, seeds and also greens and fungi, but they shouldn't be your only source of protein in the wild, as, individually, they offer an incomplete quota of amino acids, which are needed for muscle cell growth and repair. You would probably have to be pretty lucky to get the required mix-and-match combinations of amino acids from wild plants alone.

Vitamins, minerals and fibre

Not quite as much of a survival-diet priority, but still vital to our overall condition, are the other essential nutrients, such as vitamins and minerals, and also fibre, all of which are found in a variety of plant foods.

Vitamins are needed for a number of functions within the body. Some can be stored in the body and others need to be included in our food as often as possible, or problems associated with long-term vitamin deficiency can occur, such as scurvy, rickets and poor eyesight. Vitamins can be destroyed if cooked or boiled for too long, so always aim to steam vitamin-rich foods to obtain the most nutrients from it. Vitamins are found in fruits, vegetables, fungi and grains, and also in organ meats and fish oils.

Minerals are found in vegetables, fungi, grains, fruit and nuts and are vitally important for maintaining strong teeth and bones, producing energy from the food we eat, maintaining muscular function ... In fact, there's a mineral of one sort or another involved in almost every bodily function. Which brings us nicely onto fibre!

Fibre can be found only in plant foods and it is important in helping other food and waste pass through the gut more easily. In the survival diet, fibre will be found in quantity in starchy foods such as plant roots and wild seeds.

The amounts of vitamins, minerals and fibre we actually need to stay healthy are fairly small, and many vitamins and minerals can also be found in animal products. So, as long as we are gathering a wide range of different resources and not just the easiest ones or the food you're most familiar with, everything our bodies need to function properly will be accounted for. Therefore our second priority aim after gathering enough food, must be to gather enough of the right foods in order to achieve a balanced diet. Admittedly, getting a balanced and varied diet can be very dependent on the changing seasons, but remember that hunter-gatherers managed to survive and thrive all year round, so the right foods and nutrients must be out there – you've just got to learn where to look. A knowledge of where the above food groups and nutrients can be found in the natural world will concentrate your efforts in the right areas.

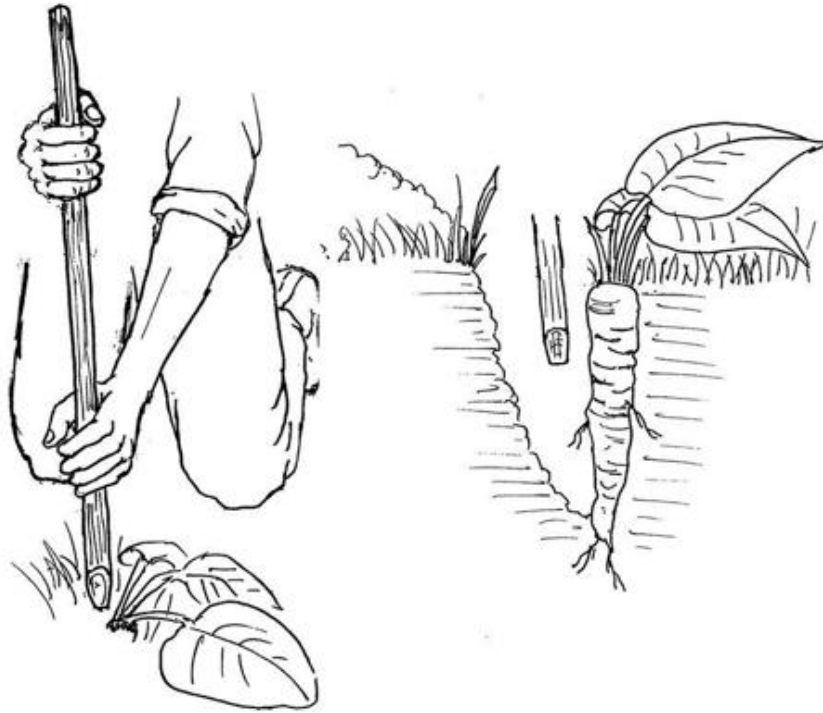
WHAT'S THE BEST OPTION?

If you're in the right place at the right time, it is possible to obtain a glut of wild plant foods to make up the bulk of your diet and prevent you having to run around the wilderness throwing sticks at animals quite so much. At other times you'll have to be pretty resourceful and inventive to feed yourself successfully. However, if you're relying on wild foods for survival, then you must get your priorities right and think about the calorie maths. Remember that even food for free comes at a price, and you must consider how much energy will need to be expended in gathering and sometimes processing certain plants. This must be offset against the energy they're likely to provide.

An awful lot of attention is given to the wild greens, herbs and fungi of our forests, but this is really a matter of what tastes good over calorie content. Two autumnal/fall examples at quite different ends of the scale are hazelnuts and wild mushrooms. Beautiful and mysterious mushrooms bursting forth from the ground, engorged with goodness, weigh in at around 25 kcal per 100g/3 ½oz. On the other hand, and at the

same time of year, the same weight of humble hazelnuts will provide a much healthier 600 kcal, as they are very high in fat, whereas the fungi are mostly water, vitamins and minerals. Most definitely food for thought.

53. A sturdy digging stick with a fire-hardened chisel point is perfect for extracting carbohydrate-rich roots



Roots

A plant stores all its starchy carbohydrate goodness in its roots, which can be quite sizable in some species and so often provide a good calorific return. Generally the best time to harvest any root is at the end of the growing season, so late summer–early autumn/fall. If the plant is one that sends up a tall flowering shoot, try to choose specimens that haven't yet flowered so that their stored energy is still intact. Some roots require some serious digging, so you will need to make a digging stick. If the root is growing in hard ground, use the stick to excavate the soil from around the root until it can be lifted clear. If you try levering it up, you might get just half a root for lunch. On the other hand, in softer or sandy soil your root might stand up to some levering. Go for the softer-ground option wherever possible, as the digging is easier and the roots normally more swollen.

I think of an average burdock root being about the size of a very large carrot, but have frequently found some giants that are around three times as long. Some roots, such as the starchy rhizomes of the greater reedmace, are found all year round, are quite large and can be pulled from the soft pond mud rather than needing to be dug out of hard soil – the perfect example of high calorific return for minimum output! Other plants with starchy edible roots can be so small as to seem insignificant, but if found growing in the right soil conditions they can be easily gathered in quantity just by

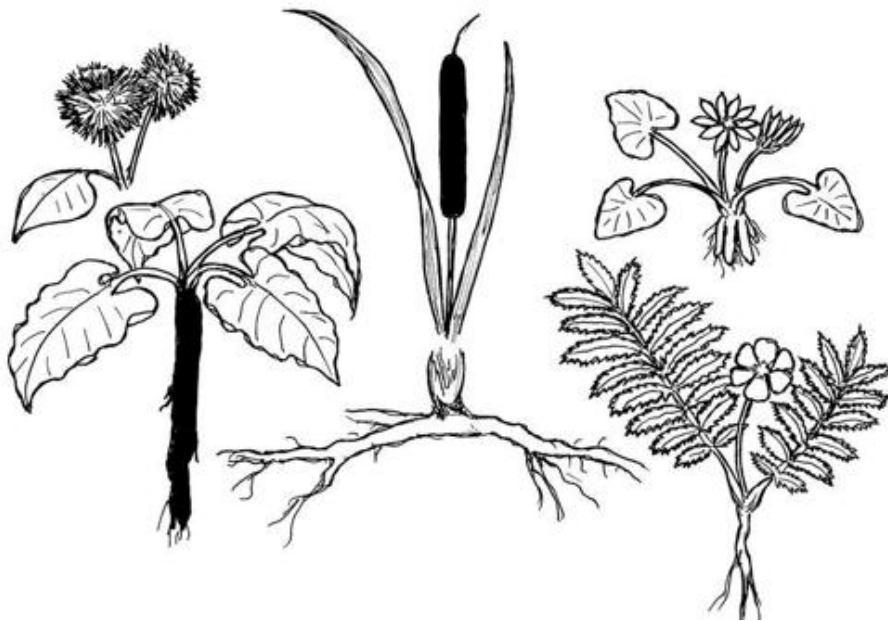
rooting around with the tip of a digging stick, and then cooked by laying them in the edge of the fire. Again: minimum effort for a good return. Silverweed and lesser celandine are good examples here.

Roots need to be cooked to release their starches. The larger ones often have a hard woody outer rind. This can be softened by par-boiling, and then the roots can be sliced up and fried or roasted like little chips. The outer rind can also serve as a protective covering, allowing the roots to be cooked straight on the embers. Other roots are edible only after being cooked and are classed as toxic when raw. Generally with these plants, the leaves and other parts are also poisonous.

Roots can sometimes be found out of season, if you know where to look, but this is a risky strategy unless you are completely familiar with not only the root minus its leaves and stalk (to aid in identification) but also any other roots in the area that look similar but are toxic.

54. Four plants with good roots

Left: Burdock – harvest it before the tall flowering shoots (shown top left) emerge. Middle: Cattail or greater reedmace – easily found all year round in ponds and stream margins. Top right: Lesser celandine – the roots are toxic unless cooked. Don't eat the leaves. Bottom right: Silverweed – small roots but easily gathered in quantity in the right location.



Trees

Trees can provide fruit and nuts, but also have a few other edible resources up their sleeves. Some, such as beech and hawthorn, have edible leaves very early in the season. Go for only the brightest, emerald-green, newly emerged leaves and eat as a salad. When they get older, they become bitter and then mildly toxic. Pine, spruce and some firs have needles packed with vitamin C for making a warming and healthy drink (see page 150). Their inner bark can also be eaten, but this can be a bit of a process. The outer bark must first be removed by scraping, then the inner bark prized away and either dried and roasted or boiled and then roasted. The dried and fragile bark

must then be ground up for flour, which can be made into ash cakes. Do not confuse these edible conifers with the extremely toxic yew.

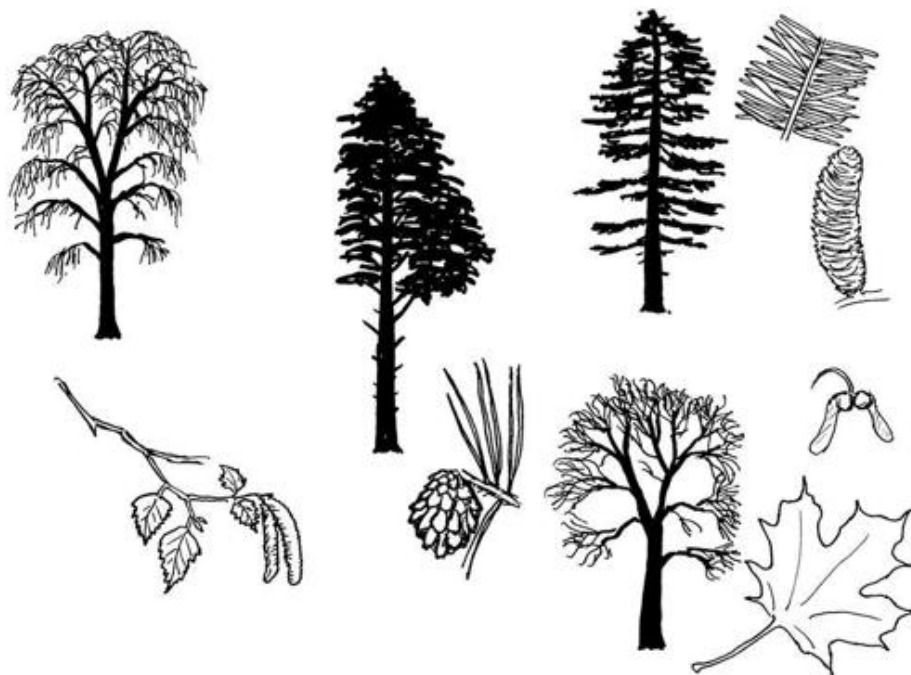
Silver birch, sycamore and maple trees can be tapped in the spring for their slightly sugary sap, which can either be drunk straight from the tree or can even be boiled and reduced to reveal the sugar. Keep your eyes on the sap if you decide to try this, as nothing seems to happen for ages until you get bored and briefly switch your attention to something else, then the sap selfishly boils away as quickly as it can and the valuable sugar you've been waiting for just burns in the bottom of your pan!

55. Edible trees

Left: Silver birch (with detail of leaves and catkins below) – tap it for sap in the spring. Middle: Pine (with detail of cone and needles below) – edible needles and inner bark.

Top right: Grand fir (with detail of needles and cone to right) – vitamin C-packed edible needles and inner bark; excellent source of shelter thatch and glue.

Bottom right: Sugar maple (with detail of winged seeds and leaf to right) – tap for sap in the spring. Boil off the water to create syrup and eventually (if you're careful) sugar.



Nuts

Nuts are incredibly nutritious but also very seasonal. At the right time of year you can really clear up if you build nuts into your diet. Some are edible raw; others benefit from being roasted to make them more digestible; still others, such as acorns, need to be put through a process of leaching in running water for several days to remove the tannins, which make them too bitter to eat. Generally, any long and complicated processing is well worth it when it comes to nuts. They can be gathered very easily in huge quantities, are packed full of high-calorie fat, as well as varying amounts of protein and carbohydrates, and can be dried and ground into flour, so store very easily.

56. Edible nuts

Top left: Hazel (with detail of nuts and leaf to right) – nuts are high in fat and protein. Top right: Beech (with detail of nuts and leaf to right) – very high-calorie nuts but small. Heat the shells to make them split open easily.
 Bottom left: Sweet chestnut (with detail of nuts and leaves to left) – very spiny husks but large nuts.
 Bottom right: Oak (with detail of acorns and leaves to left) – the acorns are too bitter to eat raw. Leach out the tannins, dry and grind for flour.



Seeds

Seeds are a plant food we're mildly familiar with from their appearance on wholegrain bread or in packets at the health-food shop, but not many of us have processed them into flour. They can be found in the wild and offer a good source of carbohydrate, but need to be gathered in vast amounts and require quite comprehensive processing. They usually appear around late summer, and you really have to know a plant well to catch it at the right time. Once gathered, they need to be winnowed to separate them from their tiny husks (gentle blowing should do this). So that we can absorb the goodness from them as they pass through our gut, they must be carefully toasted and then ground up – not easy, as they're often a lot smaller than seeds we might be used to.

If you have access to a lot of seeds, then this processing is worth it. I once walked through a dense, damp woodland, forcing my way through swathes of pendulous sedge bushes. When I reached my camp, I had unwittingly gathered two thigh pockets full of perfectly ripe seeds. These needed only winnowing, grinding and mixing with water to make little patties, which I cooked on a hot rock next to the fire.

57. Edible seeds and grinding method

Left: Pendulous sedge – good seeds, but catch them at just the right time, around late summer.

Bottom left: Fat hen – seeds are found late in the year and are extremely nutritious. The leaves are also rich in iron and protein.

Top middle and right: Two types of plantain – ribwort and greater – both of which have little seeds growing on a rat's tail stalk (longer on the greater plantain). Simply hand-strip them when you see them in late summer. Greater plantain can sometimes be found in abundance in large open areas and seems to like being trodden on.

Bottom right: using two rocks to grind the tiny seeds before adding water and cooking to make a simple flatbread.



Greens

Covering a pretty broad spectrum, these are of value to the survivor but not necessarily of high calorie content. From extremely nutritious nettles to flavoursome but tiny hairy bitter cress, greens offer plenty of fibre, vitamins and minerals. In the case of nettles and similar spinach-like plants, they can also supply quite a healthy proportion of protein. They can be found for most of the year in one form or another, although they're at their best in early to mid-summer. They should be added to stews, but only at the last minute to avoid destroying their precious nutrients. Some good green leaves come with carbohydrate-rich roots attached and edible seeds at the right time of year, providing a highly nutritious package.

The smaller salad plants, whilst brimming over with every vitamin and mineral under the sun, are also invaluable as flavourings, turning an earthy-tasting mush into something we can really look forward to. These can be eaten raw to conserve nutrients, but must always be washed well with sterilized water first. One of my favourites is hedge garlic, which is one of the first 'interesting' plants to pop up in the spring and puts in another quick visit in late autumn/fall.

As with most things, there are baddies as well as goodies. Pay particular attention to the umbellifer family, which contains lots of very similar-looking plants, some of which are extremely tasty and others that can kill you with one mouthful!

58. Eat your greens!

Left: Hedge garlic – mild garlic-mustard-flavoured leaves in spring. Top middle: Hairy bitter cress – peppery flavour, found most of the year. Bottom middle: Wood sorrel – sharp tangy taste, but don't eat more than a handful in any one day. Right: Stinging nettle – remove the stings by pulling through a gloved hand or briefly passing through flames. The spinach-like leaves are rich in iron and protein.



Fruits

Fruits come in many shapes and sizes but all tend to be out around the same time: late summer to autumn/fall. They provide us with sugary carbohydrates aplenty and lots of vitamins, and, in the case of the rosehip, one of the most concentrated forms of vitamin C there is. Handily, these can be found in the winter months too. Despite having a very definite season, fruits store well and should be pulped, sieved, rolled out flat and slowly dried to make 'fruit leather', which will keep for a long time once its moisture has been expelled. The important sugars and many of the vitamins remain intact in a concentrated form.

Not all fruits can be plucked from the tree and eaten. Some are extremely bitter or sharp-tasting and need to be cooked before being eaten, whilst others have pips containing cyanide that must be removed or made safe before the fruit is eaten in any quantity. Crab apples are barely edible when first picked, but, once impaled on the end of a stick and held over the heat from the fire, they begin to caramelize and make the perfect pudding.

Be warned, though: there are some very colourful and appetizing-looking berries out there, but some of them are deadly if you pick the wrong one. Research thoroughly.

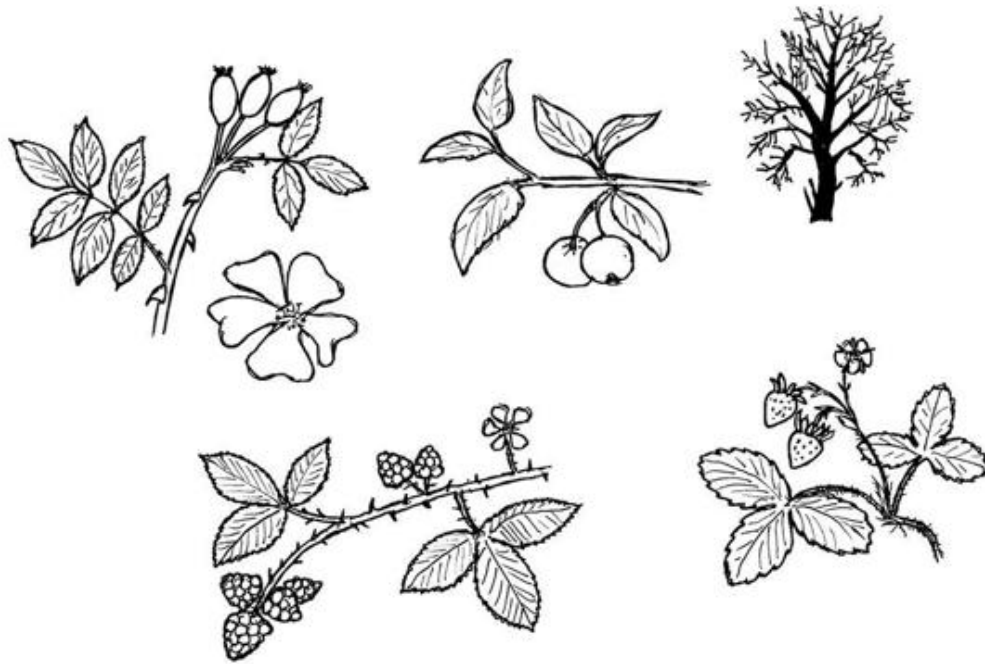
59. Wild fruits

Top left: Dog rose with rose hips (with detail of flower to right) – bright red fruits in late autumn/winter. Remove the itchy hairs in the middle or pulp and strain into a syrup.

Top right: Crab apple tree (with detail of fruit and leaves on left) – heat to reduce the sharp taste.

Bottom left: Bramble with blackberries – the very young stalks are edible and the fruits are one of the best tasting and easily recognized.

Bottom right: Wild strawberry – found in early summer. Small but extremely tasty.



Seaweed

Quite an overlooked food, seaweed should definitely form part of your diet if you happen to be near the coastline. It's very easily gathered and can be collected in quantity during your hunt for limpets and winkles. With the tide going out and coming back in again, you'll probably be supplied with a regular top-up daily. You would have to try pretty hard to poison yourself with seaweed, as there aren't really any poisonous ones, only 'inedible' variations. They contain an unbelievable amount of vitamins and minerals, along with quite a healthy portion of protein and lots of carbohydrate. Seaweed can be dried for storage and added to most meals to increase the calorie content as well as thicken it up nicely.

Fungi

Wild mushrooms and fungi are composed mostly of water, so don't offer a high-calorie package per kilo/pound of weight, but they are extremely tasty and transform a survival meal. They seem to captivate foragers, due to their mainly elusive nature, which occasionally erupts into a flamboyant display for a very brief period. Like fruits and nuts, the fruiting bodies of most good fungi have a season lasting from mid-summer through to early winter, although some can be found all year round and a few prefer the spring. They dry well and retain their nutrients and flavour until they're rehydrated again in a stew.

Proceed with caution, however, as fungi contain some of the most deadly toxins known to mankind and there are a few that will drop you stone dead. It's sensible to have a healthy fear of fungi, as there are some that give no second chance; and once

you know them and just how deadly they are, you will wonder how they aren't being surrounded by little electric fences every autumn in our over-cautious world.

With fungi, get some proper hands-on training before you experiment with anything, and spend just as much time getting to know the poisonous ones as the edible varieties. There are some very convincing lookalikes! Your best bet for starters is to ignore any fungi with gills, even if they look like the ones you buy in the shops, and concentrate your efforts on the boletus family and a few edible bracket fungi, where you have a much reduced chance of eating something you shouldn't, and the ones you can eat are some of the best-tasting and easiest-to-identify fungi.

60. A few fungi

Top left: Amanita family – contains the most deadly and easily confused fungi. Avoid ALL fungi with gills under the cap (the typical 'bicycle-spokes' appearance of familiar cultivated mushrooms) unless you are well trained and sure of a positive ID. If you're unsure, it's just not worth the risk. Top right: Chicken of the woods – yellow bracket fungi that looks like Styrofoam with a chicken flesh-like texture inside. A good edible fungi but also an example of one that could grow on a toxic host – the yew tree.

Bottom left: Boletus family - spongy 'pores' under the cap replace gills. A safer bet for the amateur forager, as long as any with red parts are avoided completely.

Bottom right: puffballs, common puffball – these are also a good family to stick to for the amateur, but check to see if they're a true puffball: they must have a completely pure white interior and no sign of a young, forming mushroom inside.



A STRATEGY FOR FORAGING WILD PLANT FOOD

This chapter is not designed to be a comprehensive guide to every single edible plant food on the planet. Rather, it is an introduction to foraging, the value of wild plants and the realities of using them as food. There are tens of thousands of plants around the world, each one with a story to tell. Each environment has its own good source of carbohydrate, plant protein or surprisingly tasty treat. Where the same plant grows in

several different countries, it will often have its own colloquial name unique to that area, and the important historical uses associated with it could also be unique to the country it happens to be growing in. The same plant could be known by another name and for another use somewhere else. This can be confusing at first, but it gives us an insight into how different people incorporated it into their daily lives and helps us to realize its many values should we ever need to make use of it. The subject of using wild plants for food is a fascinating one and really should be a book in its own right. Luckily, lots of other people around the world who spent longer in school than me feel exactly the same way and have done exactly that. These people have devoted their lives to the subject and you should listen to what they have to say.

My advice is to buy or borrow three different books about the plants in your area, with at least two of them having good colour pictures. This way you can cross-reference effectively when first identifying a plant. Get used to using their botanical names, as these are universally known worldwide, whereas local names can cause major confusion. You can't expect to learn everything overnight, so be content with drip-feeding yourself information over a period of time. Let the information sink in. If you positively identify a plant and the book tells you how it can be used for food or equipment, then make every effort to eat it or make something useful from it. Then it will stick in your mind forever.

The following few pointers should form the foundations of your foraging efforts wherever you are in the world.

Safe, sensible and responsible foraging

- In your training, prioritize learning plants that give a good return of energy for the effort spent gathering them.
- Out of these, aim to familiarize yourself intimately with those that can be harvested throughout most of the year.
- Learn the telltale signs that point to the hidden presence of a valuable plant out of season, such as the dead stems and seed cases. These will give you a sneak preview of what could be emerging very soon but also an indication that the dormant root may still be down there.
- Always be absolutely sure that you have identified the plant correctly. If you're in any doubt at all, don't take the risk. Cross-reference constantly, using three or more guides, and always err on the side of caution. With fungi, in particular, it pays to have a healthy fear of eating them: avoid any immature or haggard-looking specimens; don't go near gilled fungi until you get to know what you're looking for; and never eat any fungi you don't know by name.
- Spend just as much time researching the poisonous plants as you do learning the edible ones, so as to avoid any confusion between lookalikes.
- When you're looking for a positive ID on a plant, ensure that you have all the parts intact – leaves, roots, flowers, everything – so you can be absolutely sure.
- Don't forget to look at the type of environment or time of year that a plant or mushroom is growing in, and use that as an important identification feature also.
- Once you have positively identified a plant, make a note of its appearance during every stage of its lifecycle to avoid confusion with other plants in their early stages.

- Don't forget that just as with the food we buy in the supermarkets, wild food can affect different people in different ways. What is universally classed as being edible for most people might give another person an allergic reaction. If you are trying something edible for the first time, then try a very small amount, maybe even by rubbing it on the skin and then the lips first to see if a reaction is felt. After 15 minutes you could put a small piece in your mouth, then chew it but spit it out again. Give yourself as much time as possible between steps to let any symptoms appear before finally eating a small amount and waiting to see if it brings on an obvious allergic reaction. This is also recommended as a survival edibility test on unknown plants by some instructors, and the waiting time suggested after swallowing a small piece is 5–8 hours! Even so, some toxic plants can take a lot longer to reveal any symptoms and others can do some serious damage after you have ingested the tiniest piece, so your best bet is always to learn what's good and what isn't first and save this test as a 'belt and braces' safeguard to see if you have an allergy to a known edible plant.

- Be wary of gathering any plant that is growing alongside a known poisonous plant – it's just not worth the risk of a mix up. Also, look out for poisonous lookalike intruders growing amongst your edible harvest. I've found poisonous honeysuckle berries growing amongst edible hawthorn berries, and deadly nightshade growing amongst blackberries in the past.

- Be careful not to deplete a certain area of a resource. Always ensure that you leave a good amount to reproduce, so that it will always be there for the following year. Also, remember that we aren't the only creatures looking for food, and squirrels can't go to the supermarket!

- During your training or when foraging for fun, have a close look at the area you are gathering from. Anything growing close to roads is in danger of being contaminated to a certain degree. The same goes for well-used parks (go for plants growing above Great Dane peeing height and you'll be OK). If you're going for waterborne plants, have a look at the water they're standing in – is it likely to be contaminated from nearby habitation or industrial sites? Be wary of any pesticides used on farmers' fields, and in the case of fungi, have a close look at the host species. Chicken of the woods, a brilliant and tasty polypore fungus, occasionally grows out of the very poisonous yew tree.

- Lastly, but still importantly, outside of a genuine survival situation, you must always seek the landowner's permission before gathering any wild resource, especially when digging up roots to eat.

Happy foraging!

WILD MEAT

Stalking and hunting

The reality of a survival diet is that wild meat often provides a better return of calories and, in turn, energy, than wild plants. It's also a valuable source of many byproducts vital for life in the wilderness.

THE VALUE OF WILD MEAT

Any diet requires a certain amount of protein. Protein is the food that feeds our muscles, repairing them and making them stronger. It is essential for cell repair and processing food in the stomach and provides energy when all other stored sources have been exhausted. We only have a certain amount of stored protein, and when it is tapped for an energy source other symptoms of protein deficiency become apparent: hair and skin suffer; muscle tissue is lost and cannot be replaced as the body slowly depletes its stored supplies; and we slowly deteriorate. Therefore it must be replaced in our food.

Protein

Complete protein is found in red and white meat, fish and eggs primarily, whilst incomplete forms can be found in other animal products, such as milk and cheese, and also certain plants. Nuts are good and, to a lesser extent, seeds, grains, beans and fungi, as discussed in the previous chapter, but you will need to employ a 'mix-and-match' strategy to take in all the amino acids required. A complete protein has all the amino acids we need already present in it. Because an outdoor existence, whether survival situation or not, requires some hard physical labour, you should aim to take in somewhere in the region of 1g of complete protein per 1kg of bodyweight every day to stay healthy and repair muscles. That's the equivalent of around two chicken breasts for most people. (Add a chicken drumstick if you're a bit on the big side.)

Whilst avoiding meat and animal products is a choice that anyone living in our modern society is fortunate enough to have, the replacement forms of plant protein aren't always easy to come by in the wild, being very seasonal or specific to a certain climate. Animals, birds, fish – even insects – provide us with the best form of protein there is, but aside from that they also provide byproducts that are incredibly valuable to a survivor or someone who wishes to procure a healthy existence from the resources of the wild. Warm hides for clothing, shelter and bedding, leather for equipment and shoes, strong cordage, bone and antler for tools, strong glues and, most importantly, fat.

Fat

Animal fats contain double the amount of calories that carbohydrates and proteins provide. These calories can be more easily accessed for energy than protein. They can be stored in our bodies to provide a slow-release source of energy, keep our internal heating system fuelled and our joints, moving parts and digestive tract in good working order. Keep your water intake high if you have to rely on fat and protein as a primary energy source, as they require lots of water to break down effectively and become usable. Outside of our bodies, fat can be stored almost indefinitely as an emergency food source and also provide fuel for heating and light. In extremely cold climates and for proper outdoor work, you can forget about the swimsuit diet. Fat is good!

ANIMALS FOR FOOD

Although animals provide the best source of protein and fat in the wild, for those people who are unfamiliar with the realities of taking another animal's life, the thought of doing so can be a daunting and unpleasant one. In our modern world, even those of us who eat and enjoy meat regularly have become completely disconnected from the full story of where it comes from. The sudden unpleasant reality of the process required to put a pork chop on your plate can be difficult to stomach. Killing the food we eat simply isn't part of our lives anymore.

Like most people, I didn't grow up on a farm and wasn't even raised by wolves, so I didn't experience the natural cycle of life and death daily from a very young age, other than the slightly censored footage on 1970s wildlife documentaries. As my interest in survival techniques and wilderness living grew, however, it became obvious that total self-sufficiency in the wild had to involve the use of other living creatures as a resource – a lesson in taking the rough with the smooth, I suppose. I saw it as a vital and integral part of the whole natural jigsaw, and felt the need to become initiated, in the same way that you can't really become a climber without first coming to terms with a fear of heights.

For those of you who have chosen to look the other way when faced with the realities of eating meat, hunting and trapping can seem unnecessary and cruel. But, as you'll see, you will be hard pushed to find anyone who knows more about the life of wild animals or has more respect and admiration for them than the hunter. Speaking from my own experiences and those of many others I know, the final outcome of a hunt or the result of a successful trap line is always accompanied by feelings of guilt and sadness for the loss of life. For me, the whole subject requires a certain amount of mental fortitude, and I don't think I'll ever get completely used to the inevitable 'up-close-and-personal' element of taking another creature's life. Truth be told, I never want to, because with that huge feeling of responsibility comes the presence of mind to be selective about how, why, when and where it happens, rather than acting thoughtlessly and irresponsibly about something so important.

Easy meat

In a survival situation, you must apply a good proportion of lateral thinking to any task and give consideration to your daily calorie expenditure. In a nutshell, if there's an

easier option available to you, then take it! Searching for, and then hunting down, animals for food can be a time-consuming and energy-sapping business, so give some thought to the many protein providers that can't run away. Not that fast, anyway.

CREEPY CRAWLIES

The humble worm is an easy source of protein even for large mammals such as the badger, and certainly shouldn't be ignored if it happens to cross your path. These are little squirming packages of prime protein and only need to be collected up and kept in a container overnight to purge them. After a night in quarantine and a bit of a squeeze to clear out any gritty soil, they can be flash-fried on a hot stone. Eaten whole, they taste like bacon rind, but for fussy eaters they can just as easily be ground into a protein-rich powder and added to a survival stew.

Snails are commonly eaten all over the world, but must be well purged to rid them of any potentially poisonous plant material they may have been chomping on. This purging should take at least 3 days, during which time they can be fed on a diet of greenery that you know is safe before a final starving the night before eating. Plunge them into boiling water and simmer for 10 minutes before tucking in. In the absence of cooking pots they can be cooked in their own shells upside down in the ashes.

Some creepy crawlies should be avoided, however. Just about every deadly fungus I have ever seen has had a slug nibbling away at it, and they have been known to absorb these toxins, so for that very good reason I would steer clear of slugs as a food. Avoid caterpillars, too, as most are poisonous, irritating to touch or extremely bitter tasting. Ants, despite being extremely small, produce some quite sizable, edible larvae, which can be dug out with care from their well-guarded anthills. Even the ants themselves can be eaten, as long as they've been well cooked to destroy the formic acid inside. As for woodlice, found under every log in the wood, they taste like shrimps when fried!

EGGS

Being extremely illegal, the gathering of any wild birds' eggs must be considered an option only in a true survival situation. However, if you are in desperate need of food and you're lucky enough to find them, then tuck in, as they contain an equal quantity of complete proteins and good-quality fats for very little effort.

SMALL REPTILES AND AMPHIBIANS

Since these are normally faster than worms and snails, you are more likely to come across them accidentally while going about your daily business. Reptiles are a bit dozier first thing in the morning and have quite a good proportion of white meat in the legs and tail. I find the meat tastes a bit fishy and not like chicken, as is the rumour. It goes without saying that some snakes and lizards are venomous to the point of being deadly, so think of one as a food source only if you have no other option and you know that you're not tangling with a killer. Any poisonous or fast-moving creature does not qualify as easy meat in my book.

Be prepared for snakes to carry on wriggling long after you have removed the head (pinning the snake down with a forked stick and bashing, then chopping off the head is the best method of dispatching). This was a moment of self-discovery for me when a snake I had beheaded, skinned and gutted wouldn't stay still, and squirmed when touched for the best part of a day. That reptilian zombie still haunts me in my dreams.

Toads are mostly poisonous due to their skin glands rather than their bite, and should be avoided. Frogs, firm favourite of the French, are a better option, having good meat in the legs, but some tropical types also have deadly poisonous glands under the skin just behind the eyes, used by local hunters for tipping their poisonous arrows. Apparently, these can still be eaten if skinned and washed, but having never done this I can't recommend it and would need to be pretty hungry to try it.

Coastal easy meat

While the average coastline is virtually brimming with edibles of one sort or another, some involve more effort than others to collect. The easy protein-providers that are blindingly obvious as you comb the beach need very little hunting, only gathering. You may get lucky and find a sneaky crab or fish in a rockpool, but for the most part even these will need to be caught in a baited trap or net. Some clams require a spot of snorkelling to find them, so can't really be classed as easy meat, but others can be gathered relatively easily if you know where to look. Rocky beaches at low tide are the most productive environments to explore, but always check for any potential pollution such as nearby habitation, industrial activity, ports or even shipwrecks.

If foraging for fun, take some time to check local information regarding seasonal hazards such as red tide (not a film with Sean Connery in) – an algae that is more prevalent at certain times of year, turning otherwise edible shellfish into potentially deadly poisonous ones.

In a survival situation, too, be aware of these issues and always research any areas you are travelling through to give you a head start if things go wrong. I've told you now so you've got no excuse. Lastly, if you're aiming to head right out to the low-tide mark, make sure you have observed the same beach at high tide so you can pick a realistic escape route if the tide starts to come in, otherwise a hunt for an easy meal could very easily become a battle for survival. Steer clear of any hidden coves with high cliffs as the only way out.

MUSSELS AND CLAMS

Both these type of shellfish are bivalves, or filter feeders. Important nutrients in the water are taken in by them during the filtering process, but chemicals and pollution in the water can also go the same way, becoming concentrated in the meat. Therefore you must gather them from a clean source, if possible. Mussels just sit there, waving at you from the rocks, waiting to be collected. If healthy, they should close up when tapped. Discard any lifeless ones. They should also open up again when cooked, so this time discard any that stay shut. One word of warning though, from experience: take some time to scrape off the barnacles before you cook them. I didn't bother once

and crunched my way through my mussel stew only to feel totally sick for the next 24 hours.

Clams will need a bit more hunting, but not much. If you explore a sandy beach at low tide, you may see little raised holes disappearing into the sand. These are the front doors of the incredibly tasty razor clam. To see if they're at home, squirt some salty water into the hole, then watch and wait. They should pop out to say hello, at which point you must grip the shell with a sturdy thumb and forefinger just above the sand and hang on until they relax. Purge them in clean water for a couple of hours and then sit them in the ashes to cook in their own shells. They taste a bit like calamari.

LIMPETS AND WINKLES

To the untrained eye, limpets don't look like an easy meal. Clamped firmly to the seaweed-covered rocks, they don't even look particularly alive. However, if you sneak up on them (you really do have to do this or they hold on even tighter), they can be knocked off, into a bucket. They're grazers rather than filter feeders, so don't concentrate pollutants as much. They can easily be cooked in their own shells, upside-down in the ashes of the fire. Eat only the orange meat and don't expect them to be soft and succulent like a scallop. They're as chewy as rubber, but quite tasty and easily collected.

Winkles are little sea snails that can be found hiding in rock pools. They need to be boiled in their shells for at least 20 minutes and then extracted with a thin sliver of wood – the original winkle picker.

STALKING AND AWARENESS

To set out on a deliberate hunt can be a time-consuming activity. Even after locating and engaging your quarry, primitive or improvised weapons are unlikely to achieve a clean kill, especially with large game, so it's highly likely that a blood trail will need to be followed and the animal chased down – an exhausting business. So a good bushman is always opportunistic and constantly on the look out for the next potential meal.

To take advantage of these opportunities when they come your way, you must be in the right frame of mind, already thinking and moving like a hunter. Remaining constantly aware and on the lookout isn't as draining as it sounds, but it does require the gradual development of a certain mindset to become second nature. By blundering around with your head in the clouds, your experiences in the outdoors will be one endless series of missed opportunities. So often I see people who haven't taken the time to tune in to the surrounding countryside walk straight past buzzards sitting in branches or deer standing stock still amongst the trees. It's almost as if they have invisible 'blinkers' on, and it's this sort of tunnel vision that we modern humans seem to spend most of our life with. It's hardly surprising, really, as we don't have to chase our oven-ready chickens around the supermarket with a spear or live with the daily threat of hungry predators round every street corner.

Thankfully, this heightened level of awareness is still rooted deep within all of us to tap into when under extreme pressure, and with some practice it can be developed to become more a part of everyday life. Being highly aware is advantageous in any environment, like having an inbuilt early warning system or sixth sense. When outdoors, I frequently find myself in close proximity to wild game just by being quiet and aware enough to see them before they notice me. If the situation dictated, then I'm confident that the development of this skill would put meat on the table; but most of the time I'm happy just to observe.

Despite striving to become more aware in everyday life, it's not easy to make the transition from striding along the pavements to stalking silently through the leaves. Most hunters and trackers when entering a wild environment will always take time to sit still and zone in to their surroundings, taking note of every important detail so that they become immersed in the natural flow of the forest. If you also take the time to do this, making better use of the senses we have, you'll be impressed with how much more you begin to see and notice.

Senses

Think about the senses you have available to be tapped in to – your sight, hearing and smell being the main ones (unless you happen to be a mole or a snake, in which case touch and taste would feature heavily).

YOUR SIGHT

To see through a hunter's eyes you should train yourself to take in all the information available, like a panoramic photograph. In order to do this, you must scan everything, switching in and out of focus, searching near and far, high and low, and to the extremities of your peripheral vision, constantly looking for anything out of place, odd shapes and especially movement. You must notice the small detail at your feet, such as droppings and tracks, while still observing the limit of your vision for movement or a silhouetted figure against the skyline.

As modern humans, we are used to reading from left to right, so scan this way, too, taking in every detail in the area immediately to your front. Then skip forward the same distance again and scan that section, and then the next and so on, breaking the information into overlapping sections, like pages in a book. In poor light you must allow time for your eyes to adjust to the conditions. Even in what at first appears to be total darkness, your eyes can adapt over a 15- to 30-minute period. After this time, shapes and some detail will be easier to see, but your eyes can't focus in quite the same way as they do in daylight, and you'll zone in better by looking out of the corner of your eye! Once your eyes have adapted, try to avoid using any artificial light, which will destroy your 'night vision' and take you right back to square one. If you have no choice, keep one eye shut so that night vision may be retained in one eye at least.

YOUR HEARING

This is a very good reason for getting out into the wilds by yourself. Having some quiet time to listen to the different layers of sound in the woods will introduce you to a whole new world. Aside from being able to identify the alarm calls of different creatures, a developed sense of hearing will provide more information as to the behind-the-scenes activities of the wildlife around you and give some forewarning of an approaching creature that your eyes haven't yet picked up on. Knowing the warning thump of a rabbit's foot or the splash of a fish's tail will help to complete the parts of the picture that you can't see, especially at night, when one sense is diminished and another takes over. Keeping your mouth slightly open at night, as well as cupping your ears, will help you to focus in on a mysterious noise. Animals make some strange noises when the lights go out. I'll never forget shuddering in terror the first time I heard a vixen scream, and I'm sure I wasn't the only soldier to go to ground after hearing the unbelievably human-like cough of an enemy cow through the darkness.

YOUR SENSE OF SMELL

This one might take a bit of work but it can certainly complement your other, more well-developed senses. Our civilized nostrils are so bombarded with manufactured smells to hide other smells that it takes a while to improve this valuable sense, but after about five days in the woods I find that it gradually becomes more sensitive. Bear in mind that you'll often catch a particular smell after you've walked past whatever is emitting it, so to zone in on the source you may have to consider the wind direction.

All these senses interact with and complement each other, eventually becoming combined with a knowledge of what you expect to see from previous experience. Different animals prefer different hiding places, and as you become familiar with these, any likely hot spots will be subconsciously checked first. This combination of acute awareness and a familiarity with the habits of certain creatures will improve your luck as a hunter.

Remember, however, that the regular inhabitants of your wild surroundings have already had these senses highly developed through years of evolutionary defence against predators more hungry and cunning than us. So, while remaining constantly aware, you must also give some thought to denying your prey the very early warning systems that you are attempting to emulate.

AN ANIMAL'S SIGHT

Most prey animals don't have amazing sight, and many can't see colours, but their sense of hearing and smell will be far greater than those of a human. However, we do have the advantage of a greater intellect (some of us, anyway), giving us the chance to take steps to minimize our obvious presence. Camouflage clothing isn't always necessary as long as the shades are muted and not too bright. Very dark shades look out of place, too, so you can put your ninja suit back in the wardrobe for now. Contrasting lights and darks can help in blurring the recognizable human form and are certainly better than a single block of colour. There is a continuing debate as to whether the smaller patterns found on modern army camouflage uniforms are as effective as they should be. Seen at a distance, these disruptive patterns (which work so well close up) can all merge to become a block of colour, much darker than its

surroundings, which will stick out like a sore thumb. Don't be fooled into thinking that by covering yourself in the latest digital camouflage you will immediately become invisible. Far more attention should be given to the real basics of becoming difficult to see.

Humans have a very recognizable shape and tend to stand taller than most other creatures. Any prey animal will have this frightening image deeply ingrained after thousands of years of predation, and will scarper at the first glimpse. The human outline will stand out even more with a contrasting background, such as the clear sky, behind it. Always keep some dense cover behind you, and if you are likely to be framed against a lighter background, slowly drop down low to become less noticeable, even onto your stomach, staying close to any darker natural cover. Don't pop your head up over the top of dense foliage. Instead, try to look through it or slowly peep around the side just above ground level, where you're less likely to be noticed. Use the shadows and murky hollows to your advantage when picking a route to move across country. Always try to skulk in the shadow of a larger object, and if a ditch or similar dead ground is an available option, use it rather than strolling across open ground.

No matter how effective your clothing is at blending in, an exposed face and hands will give the game away immediately, shining out like a beacon. A brimmed hat or peaked cap will provide you with some shadow for your face, and hands can be hidden by gloves or kept in pockets.

During the close stalk or an ambush, you may have to give some thought to an effective camouflage for the face and the familiar outline of the head and shoulders at close quarters. Charcoal from the fire or contrasting mud applied to the hands and shiny parts of the face, such as the bridge of the nose, cheekbones and forehead, combined with local foliage fixed to the shoulders, upper arms and head, works a treat. A less messy option could be your green mosquito headnet worn over a hat. Shiny equipment, such as watches, buckles and frying pans dangling from backpacks, can reflect the sun, so should be hidden from view.

AN ANIMAL'S SENSE OF SMELL

I'll try to break this to you gently: you smell! We all do. In fact, to the highly sensitive nostrils of any wild beast, we absolutely pong. An animal's sense of smell is yet another perfectly evolved early warning system to avoid it becoming something's, or someone's, lunch. However, we can take steps to minimize our human stench by avoiding scented washing products and disguising our scent with animal droppings or local foliage. Even woodsmoke is effective, apparently being a non-threatening odour. The best course of action, however, is to pay close attention to the wind direction. You must avoid having your scent carried towards your prey on the wind, so always ensure that you approach with the wind in your face.

AN ANIMAL'S HEARING

Think about the ultra-keen hearing most animals have. Any jangling change in your pockets, rustling clothing or heavy footsteps will give you away before you even get close. Get in the habit of picking your route so as to avoid noisy ground cover, and

walk carefully and thoughtfully, avoiding the old clichéd snapping twig. The close stalk requires a practised technique that aims to produce little or no sound. Watch any domestic cat stalking a mouse for valuable tips (but you don't need to do that bum-wiggle thing). Watch how each foot is placed only after a careful examination by touching and feeling the ground. Practise this by very slowly placing a foot down, heel or toe first (depends on your preference and the ground cover, I've found), feeling for any rustling leaves or snapping twigs. Either carefully brush them to one side or adjust the position of the foot, but let it bear your weight only once you're satisfied it will be suitably silent. Some hunters who use primitive hunting weapons prefer to wear thin-soled footwear to heighten the sense of feeling through the feet, and stalk as close as is possible.

The hands should be used carefully to move aside any higher foliage to avoid becoming snagged. As you creep closer to your intended quarry, you may adopt a lower profile by slowly moving onto all fours and feeling for noisy ground with your fingertips, before placing your knee in the same noise-free spot that your hand occupied. A really close stalk through low cover might involve dropping onto your belly and gradually inching forward using elbows and toes, quietly clearing aside noisy debris as you go.

During a dedicated and deliberate stalk towards a highly aware quarry, you should observe its body language. You are less likely to be detected if you move closer only when it dips its head to graze. If its head pops back up for a self-reassuring glance around, you must freeze in whatever position you have assumed. Any movement will catch its attention. This leads me onto a very valid point: the best kind of camouflage of all is merely staying completely still and quiet. Roe deer up close are quite a different colour to their surrounding woodland habitat and are easily seen when on the move, but they become almost completely invisible just by standing absolutely still. This earned them the nickname of 'woodland faeries' by people who were amazed by the ability of such a large and obvious creature to appear suddenly from nowhere.

Don't start rushing out and sharpening up your hunting knives just yet, though, as all these skills can be practised without any intention of killing a single living creature. Substitute a gun with a camera or a pair of binoculars and just enjoy the challenge of getting as close as you can to wildlife in its natural environment (after checking any local seasonal restrictions or hunting laws, of course: you don't want to end up in the crossfire or annoying a raunchy stag during the rut). If you can get close to a wood pigeon, the most twitchy of all birds, with the loudest clapping wings in the world as it flies away, then you can consider yourself suitably sneaky with stalking skills of which Mr Fox himself would be proud.

HUNTING WEAPONS

We'll start with the most basic and primitive of improvised hunting weapons: sticks and stones. Be aware that all these primitive hunting weapons are illegal in modern society unless used in a survival situation for protection or to provide food. Having said that, many are still in regular use around the globe to put wild meat on the table and are extremely effective. These early projectiles of our ancestors have the advantage of being easily found, needing very little work to make them serviceable

and it doesn't really matter if they get lost in the undergrowth as you can just bend down and pick up a replacement. As with anything we humans get our hands on, they can be refined to become more effective.

The sling

This is simply a small pocket of buckskin or similar strong material to hold an egg-sized pebble. A strong cord is attached to each end, one with a knotted end and the other with a loop. The loop is fitted over your thumb and the knotted end is held between the thumb and forefinger of the same hand. A pebble is placed securely into the buckskin pocket and hangs down at your side as if in a miniature hammock. In use, the sling can be swung around the head (or to one side in a low hunting style for close cover). The speed and force of the rotation holds the pebble within the sling pocket until you purposefully let go of the knotted end to let the missile fly with far more power than throwing with the hand only. Rather than building momentum by whirling the sling like a helicopter about to take off, aim to swing just once before releasing the knot, or you will find yourself trying to hit the fleeing backend of your intended target as it scarpers. As any biblical giant will tell you, these weapons are incredibly dangerous, so if you intend to practise I would recommend you do it far away from anyone or anything, as the first few attempts will go anywhere but towards the intended target.

The throwing stick

Another very simple but effective meat-harvesting weapon is the throwing stick. This can just be a sturdy stick about 40cm/16in long which, when thrown towards the target (normally small game such as a rabbit or ground-feeding birds), spins horizontally very fast, effectively doubling its length. In close cover it can be thrown in an over-arm manner to stand more chance of finding its target through the trees, although this requires much greater accuracy from the hunter. A weighted end makes the weapon even more deadly, and by carving a chisel point in the other end and hardening it in the fire, you have a multipurpose throwing/digging stick. Other variations involve carving an aerodynamic 'wing' shape along its length for throwing faster and further in open ground. These are excellent primitive hunting weapons, which can be easily carried, ready for any unexpected hunting opportunity; and in my own experience it doesn't take too long to become a pretty deadly shot with one either. A trusty throwing stick has provided me with an easy meal on more than one occasion in the past.

The bola

This effective weapon combines the qualities of the sling and the throwing stick, but is really for use in open ground. Three or more heavy stones are encased individually in rawhide or buckskin pouches. Each one hangs at the end of a strong cord, the other ends of which are all tied together. The bola is thrown after being twirled once or twice around the head by either holding the central knot (which joins the individual cords) or by holding one of the weighted pouches. When released towards the target, it spreads

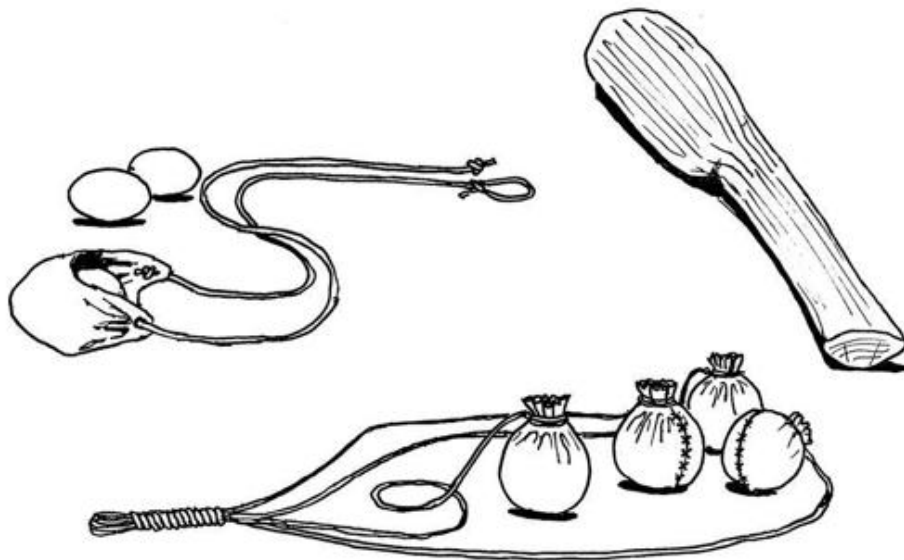
open, covering a wide area like a kind of evil flying octopus, tangling around legs, bodies and wings, disabling the prey. It's designed only to capture and not to kill, so you need to be able to swiftly follow up your catch and dispatch it.

With any 'non-sighted' primitive projectile, the secret to your success is in good hand-to-eye coordination and being able to place the improvised missile accurately on the target seemingly without thinking about it. This instinctive shooting takes a lot of practice but is possible. Strangely enough, the more you try to aim, the less likely you are to hit the intended target. However, you must be completely focused on hitting the target, like nothing else in your life matters at that moment (use the Force, Luke!). The rock or stick, even when it has left your hand, remains attached to you in your subconscious, like an invisible extended reach or a guided missile carried all the way to the target.

One of the most impressive displays of instinctive marksmanship I've ever seen was recently at a country show where I watched an old boy in a tweed flat cap and tatty waxed jacket send a veritable volley of steel ball bearings from a catapult down a 30m/30yd range. He made no obvious effort to aim and was firing from the hip, but every single ball bearing was on target, ripping through the paper bullseye with a grouping I would have been proud of had I been using a rifle with sights! No doubt the result of a lifetime of practice and familiarity with the weapon. He must have gone home that day with his pockets full to bursting with cheaply made soft toys.

61. Primitive weapons

From left to right: sling; bola; throwing stick



Pointy sticks

The simple act of carving the end of a stick into a sharp point will produce a crude spear. Hold the sharpened tip in a scrape under the fire to force-dry it, and a harder, more durable point is created. A quickly made primitive spear like this can be used for thrusting into large game from a close ambush position. Further refinement might

involve the addition of a bone or antler tip abraded to a point using coarse sandstone. The hardest and sharpest hunting points were traditionally knapped from flint, obsidian or any stone similar to glass in its structure, then lashed in place with strips of damp rawhide, which shrinks as it dries, gripping the sharp head tightly to the spear shaft.

Lying in wait with a pointy stick for a suitable quarry to walk past you probably isn't the best use of time in a genuine survival situation, although with a detailed knowledge of local feeding habits – and possibly encouraging prey animals to your chosen ambush site using bait – an ambush might bring home the bacon.

The atlatl

For keeping a bit of distance between you and your prey or in situations where it isn't possible to get close enough for an ambush, a throwing spear can be used. These are lighter and more flexible than thrusting spears and perform better when used in conjunction with a spear thrower, or 'atlatl'. The atlatl is an amazing piece of primitive technology that is believed to have been in use from around 30,000 years ago. It reigned supreme as the most deadly weapon for thousands of years until the more complicated, but more compact, bow gradually took over. It's still in use even today with hunter-gatherers in Australia and South America.

Quite simply, it consists of a flat length of wood, about as long as your lower arm, with a handle grip at one end and a small protrusion at the other designed to locate into a carved socket on the rear end of the throwing spear, or 'dart'. This protrusion, which has to take all the force of the hunter launching his dart, can be either carved from the wood itself, an off-shooting branch carved into a point or even a separate section of bone, antler or hardwood glued and lashed in place with sinews and pine resin. The atlatl grip is held in the throwing hand, with the dart resting on top. The shaft of the dart is held in a pinch grip between thumb and forefinger, and the little protruding spur on the atlatl is fitted into the socket on the end of the dart.

The dart itself is normally made from a 1–2.5m/3–8ft long, straight, wooden shaft, about as thick as a finger. The hunting point is either just sharpened and hardened in the fire or fashioned from bone, stone or antler, then glued and lashed into a carved notch in the front of the shaft. If using a sapling, ensure you use the thicker part for the front, as a bit of weight at the pointy end should lessen the chances of your dart lifting up, nose-first, in flight, like the Space Shuttle. The shaft, if cut green, can be made straight by holding any kinked sections above the heat of a fire until pliable (but not scorched) and then, using gloved hands (the shaft will be hot), correcting the kinks by holding them in position until the wood has cooled again. Continue this process all the way along, constantly looking down the length of the dart to find the kinks until it is as perfectly straight as it can be. Accuracy can be improved by adding flights similar to those on an arrow at the rear of the shaft. These stabilize the dart in flight and can be as basic as two feathers on opposite sides of the shaft, lashed in place with sinews. When the dart is finished, it looks exactly like what it is: an oversized arrow.

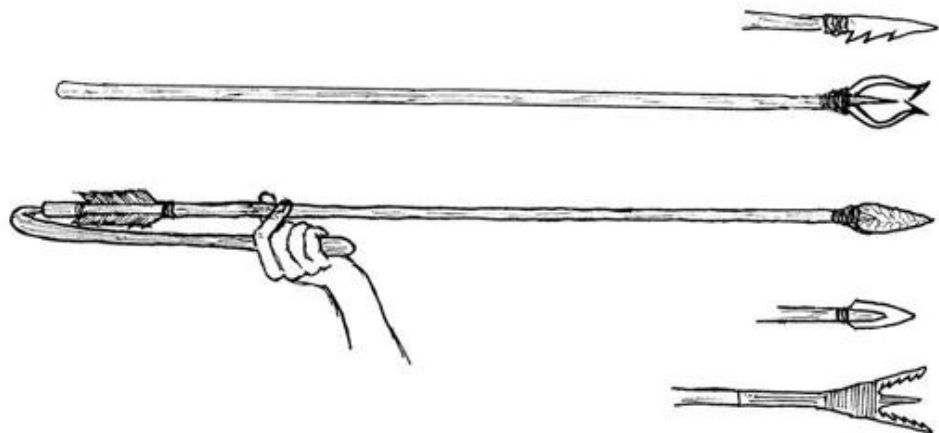
In use, the dart is thrown in an over-arm manner, similar to throwing the javelin or making a powerful tennis serve. The addition of an atlatl provides you with an extra-long arm, with all the throwing power and leverage transferred right to the rear of the

flexible dart where it locates onto the fixed spur. Watched in slow motion, all that force at the rear end makes the dart flex, then spring away from the atlatl in an explosion of kinetic energy. It's an extremely powerful weapon, capable of bringing down the woolliest of mammoths. All you need to do to harness that deadly potential is to learn how to hit the target! With larger game, the ideal target area is just behind the front shoulder, through the ribs and into the chest cavity.

62. Primitive spear heads and atlatl

Centre: An atlatl (spear thrower) shown complete with fitted, lightweight dart ready to throw. Hold the atlatl securely, and lightly hold the dart's shaft in a pinch grip between thumb and forefinger. As you begin to launch the dart, release your pinch grip and let it fly! The dart has feathered flights and a flint tip lashed in place with rawhide strips. Also shown are a number of different heads.

From top: A carved antler harpoon for fish and amphibians; a leister spear for spearing fish and gripping them tightly; a carved and abraded bone dart tip; a 'tripoon' (cross between a trident and a harpoon), working on the same principle as the leister spear.



Harpoons and fishing spears

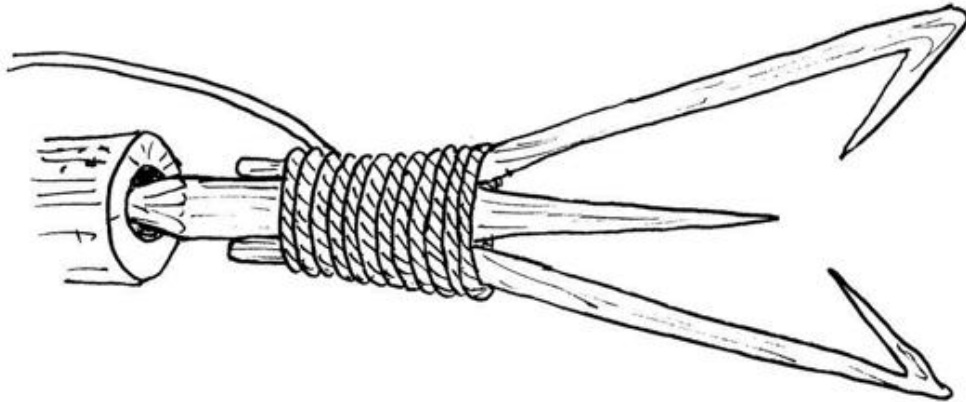
Spears can be used to catch fish, too, but they require a different arrangement for the tip. A fish speared with a simple point is likely to slip off, resulting in a lost meal. Backward-facing barbs should be added to your spear point to ensure your fish supper is held fast and doesn't escape. These small pointed improvements can be lashed and glued in place or, even better, carefully carved as an integral design from a single piece of hardwood, antler or bone to make a detachable harpoon. The harpoon fits into a hollow socket in the spear shaft and is fastened to it with a short length of line, so that if the harpooned fish wriggles too much, the harpoon can pop out of the shaft but remain attached by a length of cord. The speared fish can then squirm about to its heart's content, still stuck fast on the tethered harpoon but with no chance of breaking the spear and escaping to become something else's lunch.

A traditional fishing spear for large fish such as salmon or cod is the leister spear. This clever design has a central spear point flanked on either side by a pair of slightly flexible arms tipped with inward-facing barbs. These grip the impaled fish firmly, ensuring that it doesn't wriggle free. Used in conjunction with a moving lure or a flaming torch to tempt the fish to the surface, these lovingly crafted spear heads must be thrust with care to avoid breakage on the riverbed. When thrusting a spear at a fish below the surface, you must allow for the light refraction and aim slightly low, and remember that a spear entering the water makes quite a splash, which could scare

your target fish away. For flat fish such as flounder, you can wade through shallow water with your spear held silently below the surface just above the sand, ready to pin the fish to the seabed. You need keen eyes, as they have excellent camouflage, but I have it on good authority from my father-in-law that they can be easily taken with a spear made from an old cricket stump with a nail poking out from the end. Be careful not to impale your own feet!

63. The leister spear

More of a case of 'the one that won't be getting away in a hurry'!



Practising your hunting skills

Remember that all of the above hunting and fishing methods are illegal and that hunting or fishing outside of a genuine survival situation requires the correct fishing equipment and tackle or a suitable and legally held weapon, along with the various licences and permissions relevant to your area. As a starting point for hunting, I would recommend an air rifle, as most don't require a licence and all you need to do is find a willing landowner with a rabbit problem. However, if you have never had any experience with handling firearms or hunting in general, I would strongly recommend getting a day's training with someone who knows what they're talking about. This will prove invaluable for safe weapons handling and will also provide some vital tips on how to hit the target, the trajectory of the pellet and adjusting your sights.

SURVIVAL TRAPPING

Trapping animals and fish

If you think the hunting lark described in Chapter 7 sounds like a lot of running around the countryside with a less-than-guaranteed chance of success, then you would be right. Traps, however, are the little hunters that never stop hunting, leaving you free to get on with other jobs. Correctly made and placed, traps can keep catching time and time again, providing a regular supply of fresh meat. To stand any chance of success, however, you must understand not just how a trap works but also the daily habits of your chosen prey. This can only be achieved through the close study of animals, which can create a confusing mix of emotions as you learn more about the fascinating and intimate lives of the creatures you intend to catch and eat.

It's important to remember that, whilst effective, trapping can be a grisly activity with no guarantee of a clean kill. You will make many mistakes at the start, often at the unfortunate animals' expense, and I'm just glad that I did most of my learning at a younger age when I had a stronger stomach. This is the grim reality of trapping, and because of all these reasons, and also the fact that improvised traps can't really follow any set guidelines or regulations, almost all types of primitive trapping are illegal unless your life depends on their use to provide food. Their modern counterparts are only legal to use with the correct permissions and in exceptional circumstances.

WHERE TO TRAP

As previously mentioned, to stand a chance of capturing something you must first know every detail of its private life. Look for burrows, droppings and latrines, signs of feeding, such as nibbled leaves and grass, and especially the trodden-down 'highways of the wilds' known as the animals' 'runs'. Runs are often the best places to set a snare, as the animal is on the move, less aware of any obstruction and keen to get to its destination as quickly as possible. (By contrast, the entrance to a burrow isn't always a good bet as this is where the animal is at its most cautious, emerging from safety out into a dangerous world.)

Runs are seen most easily first thing in the morning when the repeatedly trodden-down vegetation has a light covering of dew reflecting the early morning sun in a slightly different way to its surroundings. These runs can be followed and often lead to burrows or food and water sources. Somewhere along its course you might find a soft muddy or sandy patch of ground in which the footprints of the different species using the run can be easily identified. These 'track traps' can also give you an indication of how regularly the run is used, as can fresh droppings. Sometimes runs can be blindingly obvious, especially in long grass, where they form a grassy tunnel – the perfect place for a snare. If there are no clear runs or, at the other end of the scale, too many to know where best to set a trap, then you may want to try adding a tempting bait to draw the animals in. Break up a few droppings for an idea of the most popular local food on the menu.

HOW TO SET TRAPS

Once you have found a likely location, keep well away from it to avoid leaving too much human sign. Construct any trap components in a different location and aim to spend as short a time as possible tramping all around the runs when you come to set them up. Keep in mind that animals have an amazing sense of smell, so make every effort to disguise your human scent by rubbing your hands with mud or local vegetation. Also, ensure that you carve your trap components from the same types of wood found in the trapping location, as even the wrong wood will make animals suspicious.

It's worth mentioning here that all parts of your trap should be strong enough to contain the prey you intend to catch. Even the smallest wild animal is incredibly strong when it has to fight for its life! Therefore, green wood hardened over a fire will probably be your best bet. Any cordage will need to be especially strong but also thin so as to be well concealed – not an easy combination when using natural materials. Traditionally, twisted animal hide or sinew cord has been used, but some plant fibres could work if properly prepared. Hopefully, if you have some equipment with you, strong manmade cord or wire can be liberated from jackets, tents or survival kits, so solving the problem.

As you set your traps, try hard not to disturb the area too much. Camouflage all parts of the trap with local foliage and soil, but get the balance right or it'll look even more obvious than before. Leave some form of marker that is apparent to you but not to the animal to guide you back to the trap when it needs to be checked, and keep a note of how many traps you put out. Lay as many traps as you can for the best chance of bagging a meal: I've always worked on the ratio of setting ten snares to catch one rabbit.

Once your traps have been laid, set and marked, this now becomes your working trap line and it becomes your responsibility, morally and legally, to check every single trap twice a day. This must be done to ensure that any trapped animal is held for only a minimal amount of time before being humanely dispatched, and also because in a genuine survival situation your catch is potentially a free meal to every other predator patrolling the area. I've had instances in the past where a sly fox has found my trap line and treated it like a supermarket-sweep trolley dash, making off with everything it could carry before I turned up in the morning. The most common find when checking a trap line is a moved snare or nibbled bait but no critter. This isn't as bad as it looks because at least you know there's activity in the area. All you need to do is adjust your traps slightly to make them more effective next time. Lastly, any trap line takes a little while to 'bed in' and start catching, maybe a few days. If there are still fresh signs of activity, don't move them all to a new location in a mad panic: the longer they remain in the same place, the more used to their presence the animals will become, until over-confidence takes over and they unwittingly become your supper.

TYPES OF TRAP

The study and construction of traditional traps is fascinating. Having studied and experimented with all sorts of primitive trap triggers, I have noticed exactly the same

miniature feats of engineering in use all around me in everyday life, such as old-fashioned thumb latches on plank doors, clothes pegs, even the catch that holds the car boot shut. Once you are familiar with the basic mechanics of these little sprung triggers, you will start to find all sorts of ingenious uses for them all around camp.

Deadfalls

The simplest type of trap consists of a heavy log or rock propped up, only to come crashing down, capturing the prey, when the prop is dislodged. These are referred to as 'deadfalls'. As the name suggests, in principle your catch will be well and truly dead and tenderized when you come to collect it. However, this isn't always the case, so be prepared to catch and dispatch when you move your deadfall out of the way. With larger traps, there's always a chance of accidentally crushing a hand (or worse) when propping up the weight, so employ some form of safety device, such as another log, thicker than your arm, positioned temporarily under the weight to take the force if it should fall without warning. Better still, work in pairs or use a design that doesn't involve any part of your anatomy being at risk as you set it.

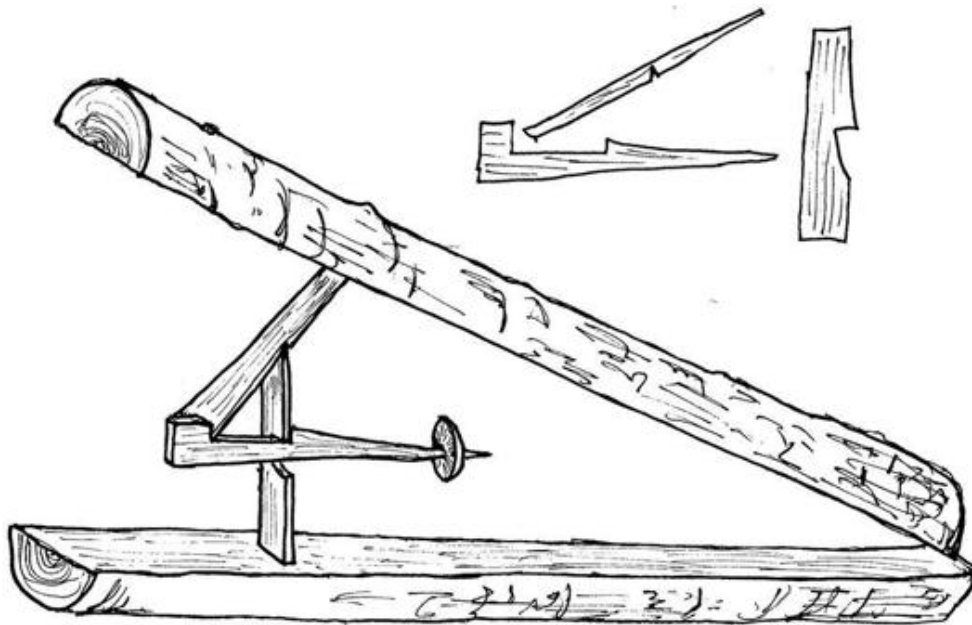
The main advantages with this family of traps are that several triggers can be pre-made while you are sitting round the campfire in the evening, and the heavy components can be found close to the trapping site, meaning that these traps can be set very quickly, using local materials and leaving minimal signs of your visit. Also, some types involve absolutely no cordage, which is useful if you haven't got any.

There are many different types of deadfall, but most are just variations on a theme, so I've included a handful of designs that cover most eventualities and that I know from personal experience are easy to set and extremely effective.

FIGURE-4 TRIGGER

A useful carving exercise if nothing else, the figure-4 trigger is an ingenious collapsible prop that can be baited or made into a trip bar. It looks confusing at first, but the key to success is in getting all the notches carved in exactly the right place to achieve the correct balancing point. When assembled, the downward pressure of the heavy weight is what keeps the prop locked together. Once the bait or trip bar is nudged, the prop comes apart and allows the heavy weight to drop instantly. Using another log or other hard surface on the bottom of the trap ensures that a 'scissor action' is achieved rather than just pounding your prey into the soft earth. To make the trigger extra-effective, it must also be balanced on a hard surface such as a flat stone or slab of wood, or it will sink into the ground and prevent the deadfall from doing its job. This trigger can also be used with a non-lethal cage trap.

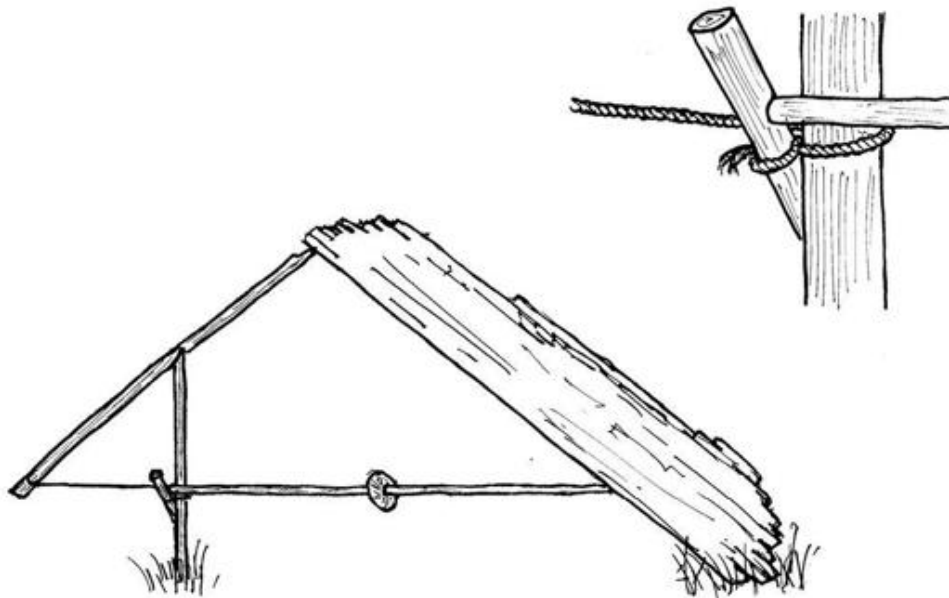
64. Figure-4 trigger deadfall and trigger notch detail



PAIUTE TRIGGER

This very sensitive trigger requires a length of cordage, but it's the wooden sticks that the cordage is tied to that really support all the weight, so twisted plant fibres could be used if necessary. The trigger bar can be used with bait (as shown) or just as a trip bar set along a regularly used run.

65. Paiute trigger

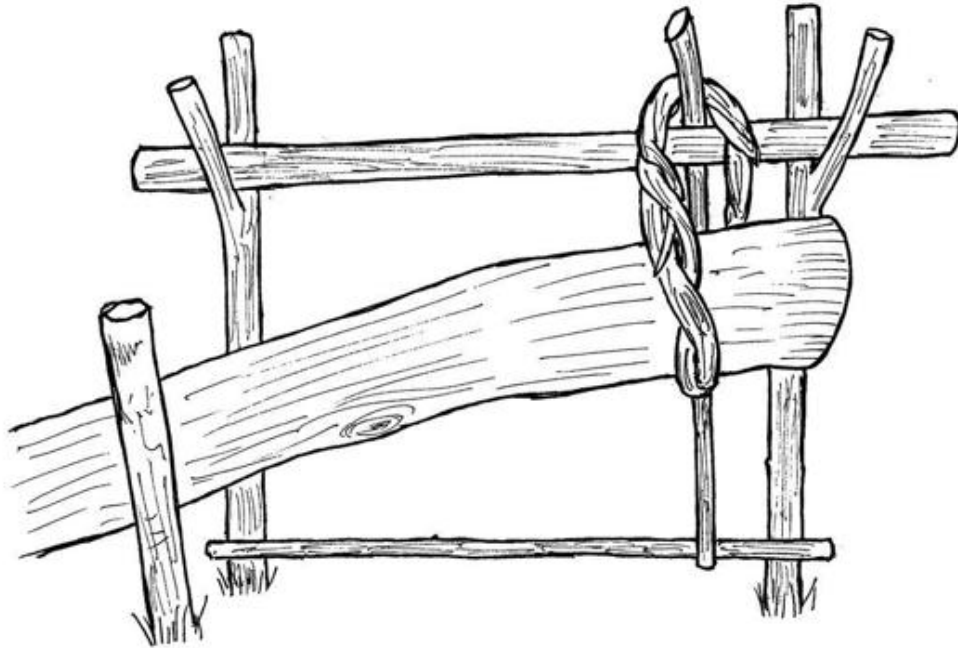


Bear trap

So-called because the design can be scaled up to catch huge animals just by using a larger log and trap components. A more modest-sized version can easily be made and set by one person, and is more than capable of capturing badger-sized creatures. The cordage shown is really just a slightly flexible hoop, so could be made from twisted green saplings, strong vines or thick spruce roots plaited together.

66. Bear trap

The horizontal retaining bar at the bottom only needs to be pushed down slightly to release the heavy weight.



Snares

The snare requires a length of strong cordage, looped into an eye at one end to become a tightening noose. Malleable wire is widely regarded as the best material for snares as it is very strong for its size, difficult to see and virtually impossible to bite through or snap. It also retains its shape when held up in a vertical position to catch animals on the run. I always carry five readymade snares in my bits and bobs bag. Again, there are many designs and types of clever traps incorporating a snare as the capturing device, but I have included what are considered to be the easiest to construct and set but also the most effective.

FIXED SNARE (THE RABBIT SNARE)

This is the most basic snare, but still extremely effective if set correctly and in the right place. Six-strand brass-wire snares with a free-running eye are still legally in use today to catch rabbits. The free-running eye (an integral brass ring) is a relatively new addition that keeps the noose from locking as it tightens. A snare without a free-running eye (self-locking) pulls tighter and tighter but never loosens, even if the animal stops struggling, meaning a quick death if caught around the neck, as intended, but a miserable and painful one if caught by a limb. The free-running eye snare is more humane by comparison, holding the animal but loosening off slightly as long as it doesn't struggle. The eventual outcome is still the same, but the humane dispatch of

the quarry is much more of a certainty if it's under the control of whoever checks the snares. If you plan to experiment with them, you'll need the landowner's permission and must follow all the legal guidelines, otherwise your activities will be considered as poaching. Lastly, never forget that snares are completely indiscriminate and can just as easily catch a beloved family pet, so always think very carefully about where you set them even if you have permission.

Tie the snare securely to a strong stake, which must be hammered into the ground just off to one side of the run. Position the noose across the run, four fingers high off the floor and opened up to the size of a clenched fist. Use some thin forked twigs to keep it set in the right position. In practice, the quarry scampers along its run and sticks its unsuspecting head through the noose, which is pulled tight by the creature's forward momentum. Very simple, but it works and can catch small mammals and ground-feeding birds.

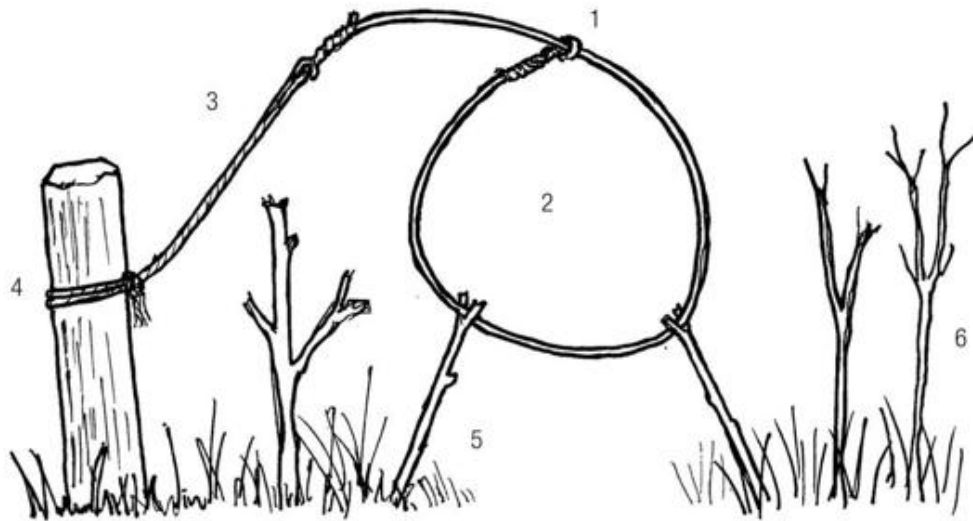
Variations on this theme can include fixing your snares at intervals along a long pole, which is then placed against a tree that squirrels use. When the squirrels become used to the pole, they will use it as an easy route up the tree and become snared. This method is illegal unless used in a genuine survival situation.

Snares can even be used as a hunting weapon in a couple of ways. The first is to tie one to the end of a long pole to loop over the heads of roosting birds. (The old poachers who made good use of this trick knew which trees the game birds were likely to be roosting in because of the dense ivy in which they like to hide and the amount of droppings at the base of the tree.) If you're the impatient kind, then another way of using the snare is to lie in wait and surprise some grazing rabbits en masse, which will then be forced to bolt for cover, and hopefully straight into your pre-set snares. With a deranged, blood-thirsty human charging at them from a ditch, they're unlikely to worry too much about which route they pick to run to safety, and are therefore more likely to run through a snare.

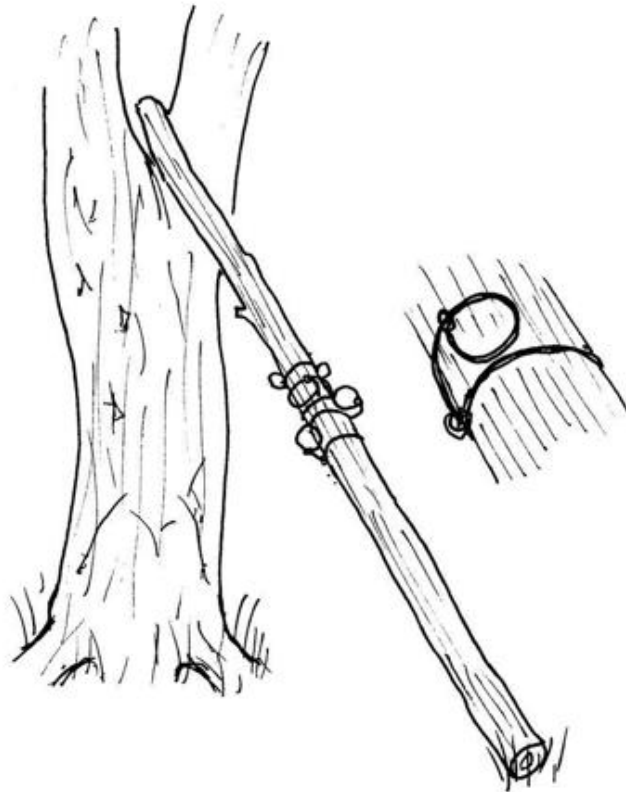
Brass wire is pretty shiny when brand new, so to darken it down, leave your coiled-up snares hanging out in the weather somewhere safe to become tarnished and dull. Natural cordage can be used in an emergency but won't be as strong as manmade string or wire, therefore it's best used with a spring snare.

67. Fixed rabbit snare

1 Running eye, 2 Brass wire noose, 3 Strong cord, 4 Sturdy post, 5 Thin twig supports, 6 Extra local foliage to subtly 'channel' the prey into the snare



68. Squirrel pole, with close-up of snare



Spring snares

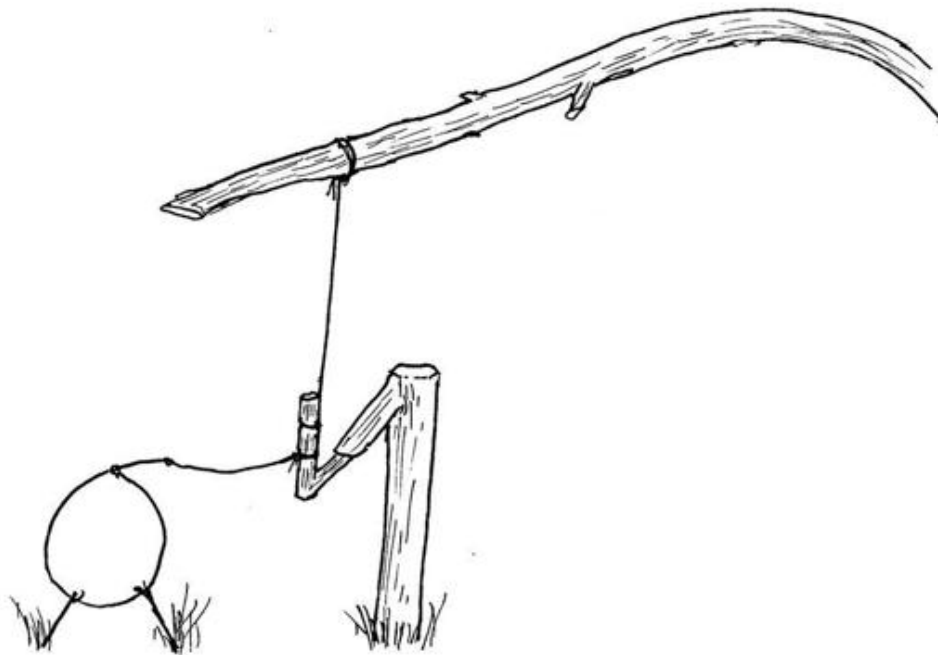
A spring snare incorporates some pretty nifty engineering and can be used to improve a standard fixed snare and also to make traps capable of capturing larger game by a limb. The snare, or noose, is attached under tension to a trigger device, which is sprung by the movement of a bait bar, trip wire or treadle platform. The tension is supplied by way of a springy sapling, branch or a 'see-saw' type of arrangement known as a pole lift. When the trap is sprung, the snare is pulled tight by the release of the component under tension. In the case of smaller game, this can lift it clear of the ground and away from the thieving paws of an opportunist scavenger; with larger game, the fast springing action ensures that the noose is pulled tight before the animal has a chance to escape. Catching large game by a limb means that it isn't killed immediately, and in some hunter-gatherer societies this provides the hunters with an opportunity to keep it alive until needed. Also, the 'spring' in the sapling works in the same way as a fishing rod to absorb some of the pull from the struggling animal, and allows weaker cord to be used effectively.

BASIC SPRING SNARE, OR 'TWITCH UP' SNARE

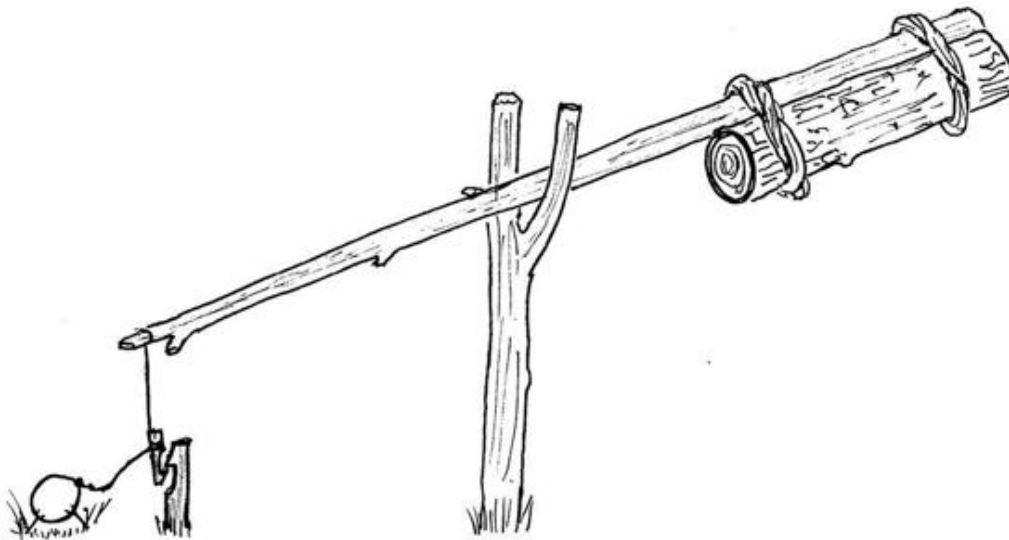
This is an easily made addition to the fixed snare. The anchor post has a carved notch or a natural 'hook'. The snare is fixed to a stick with a corresponding notch or hook that is also tied to the lifting device, in this case a sapling. When the snare catches a moving animal in the normal way, it is tugged free of the anchor post and the trap is sprung. This same trigger can be used on the riverbank as an automatic fisherman that 'strikes' when a baited hook is taken.

POLE-LIFT SNARE

In this case a carved, notched trigger and post have been used, with a pole lift used to provide the tension. Pole lifts work on a 'seesaw' principle, using a heavy weight lashed onto the furthest part of the pole as a counterbalance. These require more work to make but have the advantage of working whatever the weather and until they eventually rot away. Note that saplings, if still green, can lose their springiness if left set for long periods and can also freeze in cold conditions.



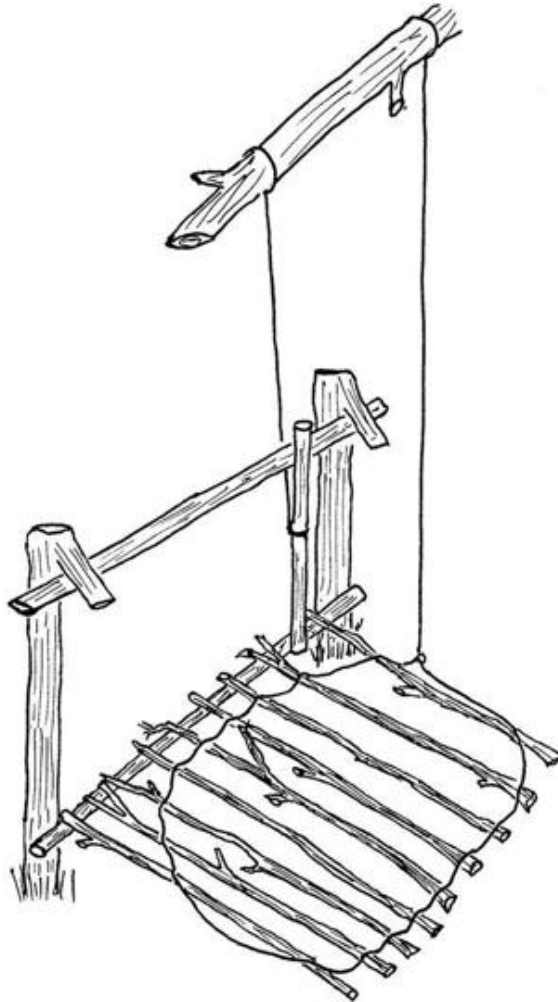
70. Pole-lift snare



LEG-HOLD SNARE

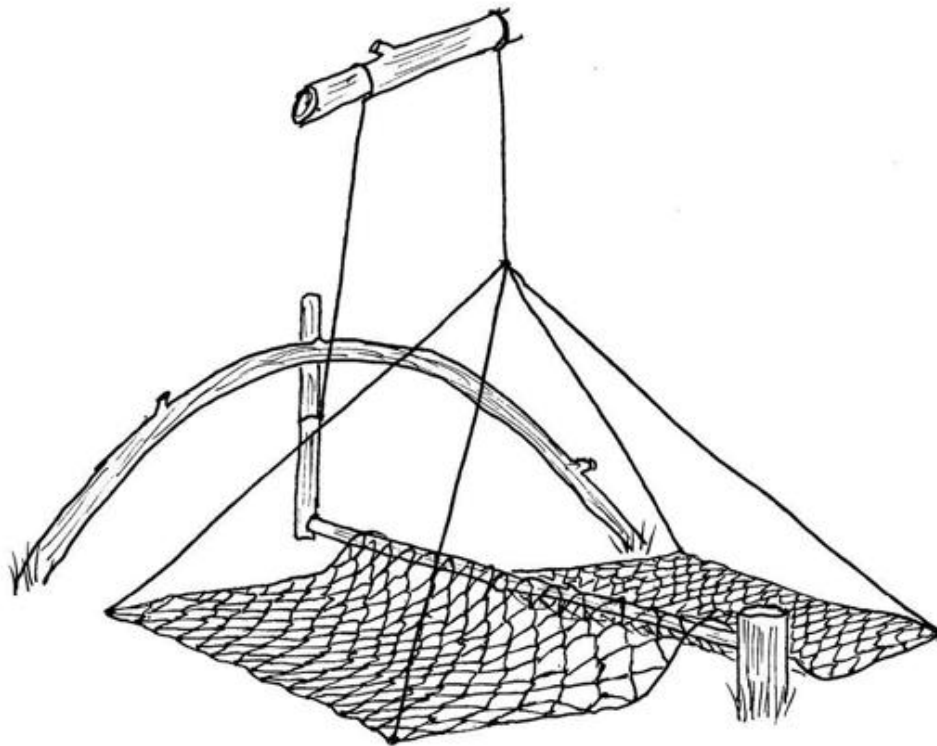
This trap could be set on a woodland trail to make use of any larger springy branches overhead. The treadle system is a solid design that could be scaled up or down depending on the size of the intended prey and is easily camouflaged once set. The noose can be replaced with a net for catching ground-feeding birds. Your two securing posts will need to be hammered well in, maybe at alternating angles for strength. The mechanism can be set well off to one side of the trail by lengthening the treadle platform, so as not to be obvious.

71. Leg-hold snare



72. Leg-hold snare (trip-bar variation)

Here a net has been used instead of a noose or snare, to catch birds and small mammals alive.



LEG-HOLD SNARE (TRIP-BAR VARIATION)

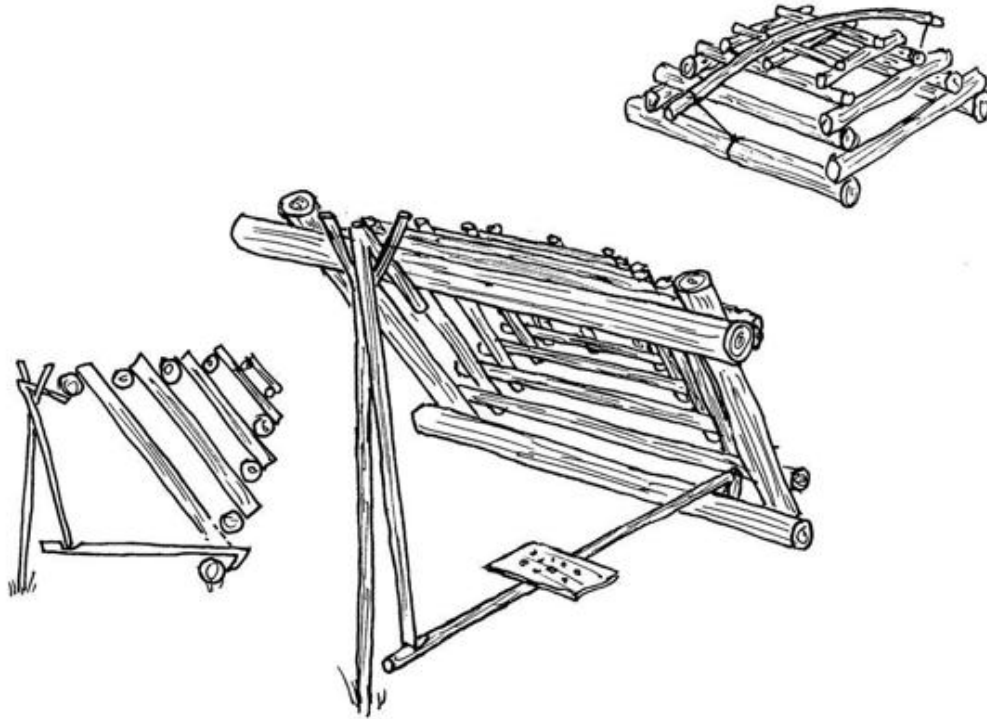
This variation can be set off by a trip bar being kicked, pushed or trodden on. Its advantage is that it's very simple to make and takes a tiny amount of disturbance to set it off. However, it can be fiddly to set up and might require a bit of carving where the sticks meet to get the right amount of friction.

Cages

As mentioned previously, a simple cage construction can replace the heavy weight of a deadfall. In a world with no fridges, this has the advantage of keeping your catch alive until you need it. Primarily designed for ground-feeding birds, it will most likely need to be baited inside and have a trail of similar bait leading up to the trap. Study the fresh droppings in the area to see what seasonal delicacy is in vogue. I've had success in the past using a similar principle by digging a small pit with a sloping ramp and propping up a heavy lid with a baited figure-4 trigger.

73. Bird-cage trap

Notice that the bottom bars are much thicker and heavier than the rest of the cage to give it some speed when it falls. Shown top right is a clever method of constructing a cage using minimal lashings. Only the bottom logs need to be lashed. The tensioned bar across the top, tied to the bottom logs, will hold all the remaining sticks in place. Carve some mini overlapping joints or leave plenty of overhang where the sticks cross in case of any lateral movement as when one stick comes loose, they all will!



Nets

Nets can be extremely useful in catching pretty much anything that swims, flies or walks, but they do require an awful lot of suitable cordage. If you happen to have an abundance of string, then weaving a net could be a good way of filling those long winter evenings. Parachute cord is excellent, having several thinner strands forming its core, which makes a lightweight but very strong net. Plant fibres can be twisted to make them stronger, as shown on page 269, but twisting enough to make a decent net will take a very long time indeed. A net can be tied together in strands or knitted with a net needle and mesh gauge.

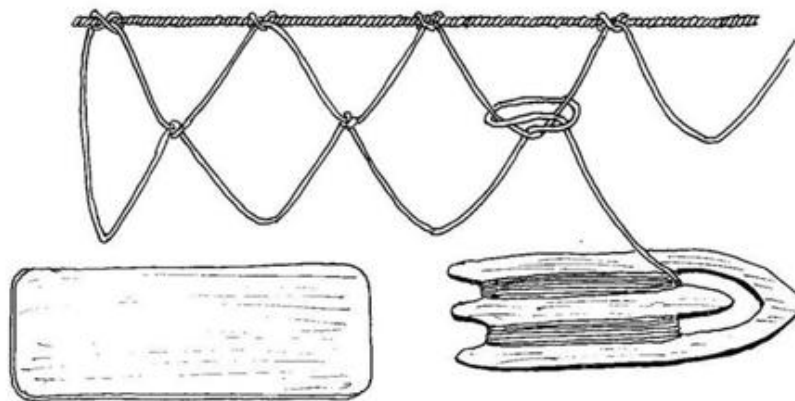
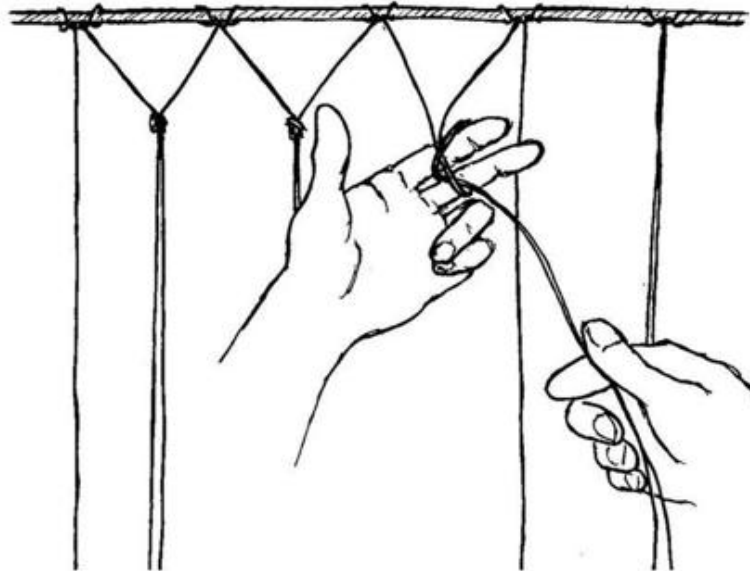
However, once made, they can be well worth the effort. A gill net, which is designed to ensnare swimming fish, is so effective as to be illegal unless used in an emergency. These need to be pretty big to stretch across a wide river, but smaller nets can be made into cast nets and dip nets, which are actively used rather than just placed and checked periodically. Keep your nets in good working order as they can easily become knotted and tangled.

Your mosquito headnet can be made into an effective dip net for small fish and coastal rockpools. One method that has worked well for me is to fashion one end of a sapling into a hoop and tie the headnet into it so that the hoop keeps the mouth of the net open. Using limpets liberated from their shells as a bait skewered inside the net, lower it slowly into the deep rockpools left after the tide has retreated from a rocky coastline. Leave it under a shady overhang for a minute and then slowly bring it back to the surface and lift it clear of the water. The tiny mesh will catch anything that crawls in after the bait – little crabs, rockpool fish and prawns – and in no time at all you should have a good meal. If you're unlucky, you can always eat the limpets!

74. Two ways of making a net

Top: This method involves simply looping doubled-over lengths around a taut line. The mesh is made by tying double overhand knots at even spacings.

Bottom: To 'weave' a net you need a net needle, which can be carved from wood or bone. A taut line is used as a starting point and your first row is secured to it using lots of little clove hitch knots, evenly spaced. A very simple knot is shown for weaving the following rows, unravelling the cord from the needle as you go. A wooden gauge inserted into each square of mesh guarantees even spacings.



Trapping fish

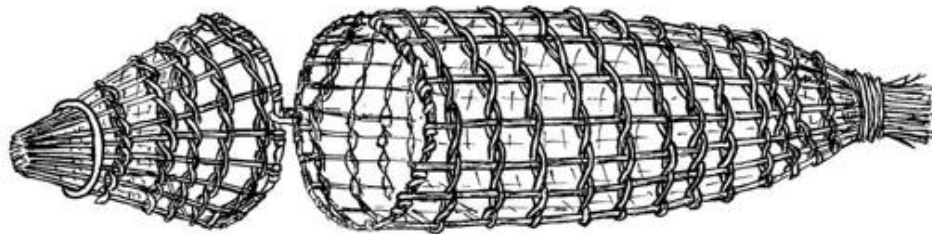
Another effective way of using a small net is to construct a fish trap. These are traditionally torpedo-shaped skeletal constructions with one or two entrances. The entrance opening takes the form of a narrowing funnel, making it easy for fish, eels

and crayfish to find their way in but a lot harder to find a way back out again. (Traditional eel traps often have a narrow cloth sleeve sewn onto the small end of the funnel as an extra security measure to ensure these slippery characters can't find the exit once inside.) The traps are normally baited with an old carcass or unwanted offal and set with their openings facing against the flow of the river. If you have a small net, a basic framework can be quickly made and covered with the mesh. Woven fish traps made entirely from pliable plants, such as willow, hazel and even brambles, have been used for thousands of years all around the world, sometimes turning up intact, buried in wood-preserving mudflats like little time capsules. These have the advantage of being very rigid, letting the water flow naturally through the fitted weave while blending in perfectly amongst the reeds and other aquatic vegetation. They must be weighted down with a suitable rock to keep them in position and tethered to the bank for easy retrieval.

To increase the effectiveness of a fish trap, whether net or basket, you can build a corral of sticks or rocks in the river to direct fish straight into the trap. Just the same as with the 'chasing rabbits into your snare' method, fish can then be herded towards the traps. If there's only a couple of you, tie some big, long leaves or brash (spindly, twiggy) wood all the way along a length of string and stretch it between you both, across the river but below the water's surface. This should be enough to scare the fish and stop them slipping past you.

75. Woven fish trap

Note that the funnel on the trap shown is fitted with a simple hinge so that it can be opened up like a door to collect any fish caught.



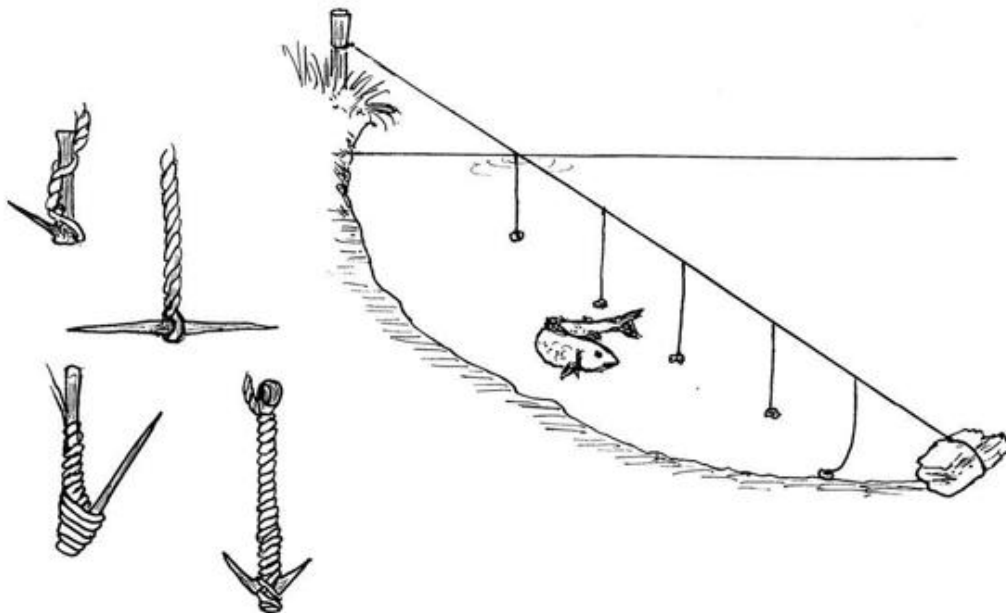
NIGHTLINES

Angling for fish is a real skill, completely absorbing dads and grandads and taking over their lives until they lose the ability to talk about anything else. Whilst it can be a useful food-procuring skill to have, it is also time consuming, often involving long hours trying to outwit the fish. Putting out nightlines is the fishy equivalent of setting snares, in that they are working constantly, leaving you free to get on with other jobs. Tether a strong line to the riverbank and fix a fairly decent-sized rock to the other end, so that, when cast, it slopes down through the water at about 45 degrees all the way to the riverbed. Before casting it out, tie thinner sections of line at intervals along its length. Each line has a hook of some sort, baited with worms, snails, even improvised spinning lures made from tin foil or bone. These are also weighted so that they hang at different heights in the water, increasing your chance of hooking something. (Some fish are exclusively bottom feeders, some top feeders and others aren't fussy.)

If you don't have proper fishing gear, you may have to make hooks and line (see illustration), but the simplest option is to use a gorge hook. This is positioned inside the bait so that it lies parallel to the line. When taken down, it will spin over and become lodged in the fish's gullet. Unlike angling, you won't be there to 'strike' and pull the wriggling fish out of the water, but as long as you check the lines regularly, hopefully your catch won't escape. When you check the lines, approach the water's edge from a low position so as not to cast a shadow and alert the fish. Also, be prepared to replenish your bait constantly, as it will either be looking a bit sorrowful or will have been nibbled off and stolen.

76. Nightlines and hooks

A long line of cordage made from twisted plant fibres, such as stinging nettles. If you haven't got any hooks, they can be improvised. The hooks shown here are, from top to bottom: a section of hawthorn twig with thorn intact; a simple but effective gorge hook made from bone or hard wood, sharpened at both ends to toggle in the fish's gullet when swallowed; a wooden shaft with a piece of sharpened fish bone, glued with pine resin and lashed in place with split spruce roots; bramble or dog rose thorns still attached to the dried stems and lashed together with bramble-stem fibres.



THE OUTDOOR KITCHEN

Preparing, cooking and preserving wild food

Every camp must have a kitchen. Even if your chosen campsite is very basic or only temporary, it shouldn't mean that the food you cook in it needs to reflect the surroundings. Everyone enjoys a good meal, and when working hard outdoors, you will find that meal times are often the most important part of the day. You must strive to make them something to look forward to, making the most of what you've got. If dipping into Mother Nature's larder, the wild ingredients you have available may be unfamiliar, so a knowledge of how to prepare certain basic foodstuffs is important.

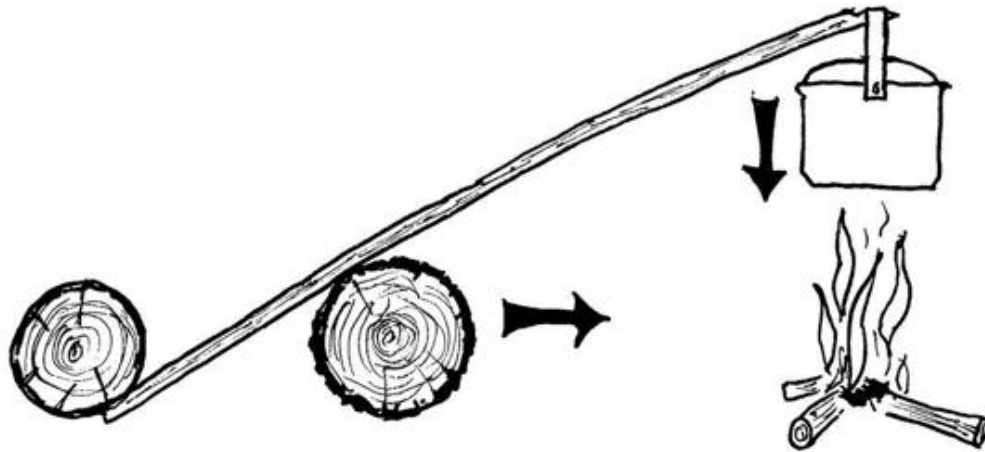
With everything we eat being well and truly processed before we get it, many of us aren't used to seeing meat clad in fur or feathers or vegetables covered in mud. It's one thing to know how to hunt and gather, but you must also know how to take that raw ingredient and transform it into something edible. Of course, in a survival situation, food is primarily fuel, but this is definitely not just about aesthetics or trying to win some kind of wilderness Michelin star: some wild foods need to be prepared and cooked to make them edible and many are bitter or woody before cooking. In order to overcome this, you must know how to grill, steam, boil and roast without any pots and pans, how to glean all the nutrients from your hunted and gathered goodies, how to keep clean and tidy to avoid illness and how to store food in the short and long term.

COOKING ON THE MOVE

If you're on the move, a small campfire under a handy natural canopy is all that's required. If I have a choice, I'll set up somewhere that has a source of water nearby providing washing-up water, a place to replenish water stocks and a guaranteed method of putting out the fire. Your cooking fire should be small and unfussy, with two logs either side as a cooking pot rest or a simple pot crane with adjustable height settings, as shown. The supporting log is moved back and forth to lower or raise the pot.

77. Pot crane

This quick and easy arrangement allows a cooking pot to be suspended over a small fire. Moving the supporting log in and out raises or lowers the pot.



FIXED CAMP KITCHENS

Camp kitchens can take many forms, from a communal campfire in a large group shelter right up to a separate kitchen area away from the living quarters with its own form of shelter and dedicated cooking fire. However big or small your camp kitchen is, the key word is 'organization': pots and pans will need to be suspended over the fire in any number of different ways; food will need to be stored properly; equipment must be cleaned; food waste must be disposed of correctly; and a meat-preparation area must be designated well away from the main camp.

Large foldable water containers are handy items to pack, providing an onsite supply so that you don't have to constantly walk back and forth to a distant water source. (Never set up a fixed or semi-permanent camp kitchen next to a water source for fear of polluting your only supply.)

Kitchen gadgets

For slightly more permanent camps, you may want to improve conditions by knocking up a few useful gadgets around the camp kitchen. In open, rocky areas this might only be at best an arrangement of suitable rocks made into pot rests and windshields; but if you happen to be near or amongst a source of timber, then you can really go to town.

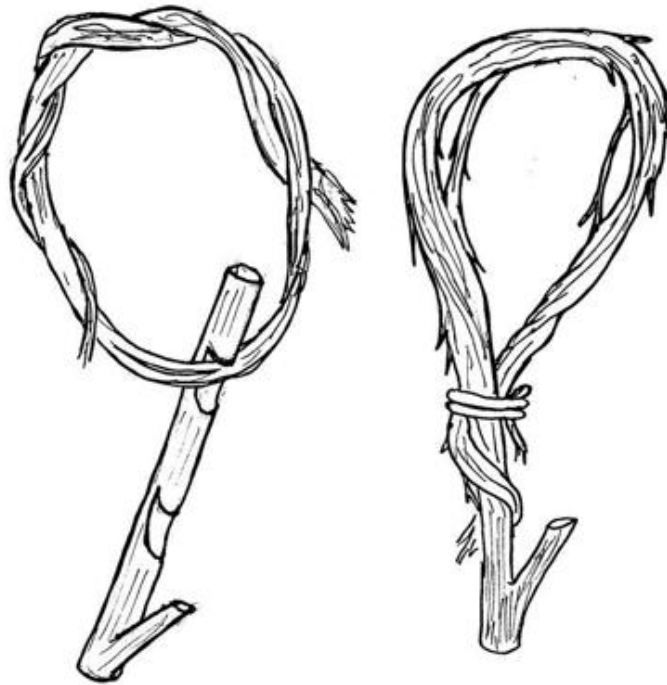
A cooking tripod with adjustable pot hanger is one of the first gadgets I make in camp. It forms the centrepiece of a well-organized fireplace and provides somewhere to suspend the cooking pot or kettle, a drying rack for preserving food and a useful place to hang cups and billycans. Over time, they build up a protective smoky patina, and I swear that some of the well-seasoned and charred wooden pot hangers I use could be buried for a thousand years and still be in perfect working order when dug up again.

Select three strong forked sticks, around 2m/6 ½ft long, and lash them together with a natural binding where the forks interlock. Hang a sturdy fixed loop, also made from the same binding material, from the apex. A carved adjustable pot hanger, capable of

supporting your biggest pot, will hook onto this. Drying racks can be added to the top of the frame for meat and fungi (and socks?). Further spars can be lashed in place to support one end of a cooking spit or an extended pot-hanging rail, as shown on the multi-fire arrangement on page 122.

78. Cooking pot hangers

Right: A carved, adjustable pot hanger, as described on page 70, with a strong hanging loop made from a withy or flexible root. The loop hangs below a tripod and the pot hanger's carved notches provide several heights for varying cooking temperatures.
Far right: A slightly less-adjustable hanger made by leaving a natural hook on the end of a twisted withy.



Kitchen organization

Something that has stuck with me from my one and only Scout camp as a child is the excellent sink stand we had to construct from sticks and string. It had a gap in which to fit a plastic basin, a draining rack, tea-towel hooks and even a pot-storage shelf underneath. This was obviously an exercise in knots and lashings as well as a useful project, but I thought it was an ingenious piece of camp furniture. If operating from a fixed camp, it doesn't take long to rig up a few home comforts like this using the local resources. It's like bringing the indoors outdoors!

Rig up a sturdy hanging rail away from the fire, maybe between two convenient trees. Use this like a woodland kitchen cupboard to hang any unused cooking pots, spatulas, carved pot hangers and stirrers, water storage bags and tea towels. This way all your equipment is kept clean and centralized in one place so that it's there when you want it rather than lost amongst the leaves or tripping you over in the darkness.

Cleanliness

In the kitchen, get in the habit of washing any cooking equipment after use so as not to tempt rats into camp or make yourself ill. Metal pots and utensils have the advantage of being easily sterilized before use by simply heating them over the flames from the cooking fire.

Also, give some thought to how you are going to dispose of your food waste. Always burn any rubbish, and if it won't burn, bury it well away from camp. Leftover animal products that can't be used (which in a survival situation won't be many) should also be burnt or buried at least 100m/100yd away from camp. Regularly give your camp a good brush out with an improvised broom of twiggy foliage to get rid of any hidden food scraps.

NATURAL SOAP SUBSTITUTES

There are several plants that can produce a natural soapy lather due to their saponin content. Red campion, soapwort, horse chestnut leaves, silver birch leaves and yucca are a few good ones. This soapy lather is much kinder to the skin than heavily alkali soaps, so is a good soapy substitute. Sphagnum moss makes an excellent biodegradable abrasive scrubbing pad for hands and eating utensils, as it contains small amounts of iodine.

PREPARING WILD MEAT

You must carry out all your meat preparation well away from camp to deter unwelcome visitors looking for scraps. In bear country, the recommended distance for a game butchery and food storage area is at least 100m/100yd from camp. Set your butchery area up near a solid, fallen tree for using as a work table, or at the very least clear an area of ground and lay down some fresh, green foliage to work on. A place to suspend game while butchering is handy, although not vital, and make sure that you have made provision to clean hands and any equipment used properly before leaving. If you've bought soap with you, it should also stay in the butchery area for fear of attracting large predators. You may need to light a small smudge fire to keep the flies away during meat preparation.

Any wild meat that comes your way must be dispatched humanely and dealt with efficiently. Your hands must be cleaned before and after meat preparation, and if you have broken skin you should wear latex gloves if you have them. Guts must be removed very early on to prevent spoiling the meat. These should be kept for using as bait, making cordage or even waterproof bags. The meat should be sectioned up, and any that can't be eaten immediately should be preserved by smoking or drying. Fat should be kept for food, waterproofing and fuel and blood must be caught for its nutritional value. Sinews can be removed and dried for cordage, whilst pelts and hides can be scraped clean of flesh, dried and softened for clothing and bedding, and bird feathers kept for insulation. Bones and antlers should be kept for making tools and weapons, the animal's brain removed and stored in moss as a tanning agent for the hide, and the eyes, feet and skin scraps for making glue. Even the stripped carcass should be kept for making stock – absolutely nothing should be wasted.

Mammals

I remember the first time I skinned a deer, after years of doing the same to rabbits, and realizing that pretty much any four-legged mammal, large or small, follows the same basic principles. Any tweaks needed to your techniques will be realized soon enough and easily dealt with. Four-legged reptiles and amphibians aren't too dissimilar either.

First, the animal should have its guts removed as soon as possible after it has been dispatched. Just in case the animal didn't have time to go to the toilet before you caught it, push down on the lower stomach to empty its bladder, then carefully make an incision through the stomach skin, being careful to avoid piercing the contents. With your blade held uppermost (less chance of cutting into the intestines, stomach or bladder), slice through the skin and thin layer of flesh from anus to neck. Remove the digestive organs. Larger animals will need to have a circling cut around the anus and genitals to ensure the rectum and connected organs are removed in one go.

The ribcage will also need to be cleaved open to reach the windpipe, which must be cut free to release the larger organs. The carcass may need to be tipped onto one side or hung from a sturdy branch to make it easier to scoop them out. Inspect the organs well while you're in there, especially the liver, and discard any that look diseased. Meat with any slightly dodgy-looking organs must be boiled. The liver should be dark red and free from white spots. Healthy heart, kidneys and liver are all considered to be 'red meat' and should be kept to eat (preferably first, as they spoil quicker, but you must remove the gall bladder from the liver before cooking). Without regular access to plant foods, Alaskan natives would get pretty much all the vitamins they needed by eating the raw liver from animals like caribou. If you ever get the chance, however, don't try this with Arctic seals or polar bears as they have extremely high levels of vitamin A, which could finish you off (if the bear doesn't first).

With the guts and organs removed, continue cutting through the skin up the inside of each limb and circling the wrists, ankles and neck, as shown. Smaller animals can just have all four paws dislocated and cut free. Take more care with larger animals so that the leg tendons can be saved intact. Ease your fingers between skin and flesh somewhere along your initial stomach cut and begin to separate the skin from the animal. With larger beasts you may need to use a stronger, clenched fist to push the skin away. Work your hand all the way around the back until it emerges on the opposite side of the stomach cut. This should give you the purchase required to peel the skin away from the carcass like a furry coat. A bit more work might be needed with a sharp blade to free the limbs without leaving any flesh attached to the skin. Cut the head free, or even twist it off to save blunting your blade.

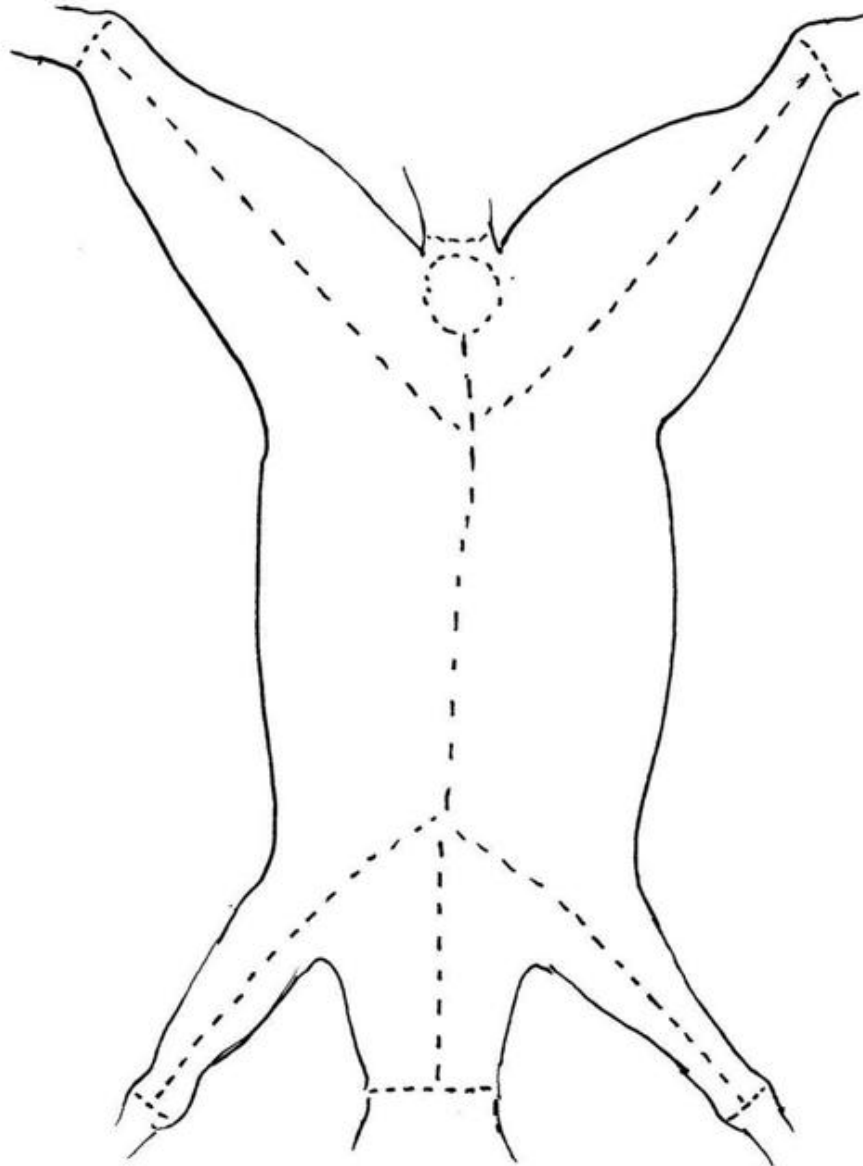
Your skinned and gutted carcass can now be butchered. The most-tender steaks are to be found in the lower back, running parallel to either side of the spine. With larger animals, remove these strips of loin meat, carefully lift away the silvery back sinew for use as cordage and either cut the meat into individual steaks or bind it up to make a delicious juicy roast joint. Rear legs, or 'haunches', can be cut away and kept whole as a roasting joint or boned out by cutting along the lines of the muscles. Front legs and shoulders are best cut up small for stews, and I like to remove all the little scraps of meat from the carcass, chop them finely and mix with herbs and fat to make

delicious backwoods burgers. Smaller animals, such as rabbits and squirrels, can be cooked either whole or jointed into four parts: the lower back, the shoulders with ribcage and the separated rear legs.

A word of warning that not everyone wants to hear when dreaming of a rare, juicy steak is that undercooked meat, while retaining more nutrients, can also harbour parasites, bacteria and viruses. Whichever method you choose to cook your wild meat once butchered, it's preferable to cook the meat until the juices run clear if you want to avoid these risks.

79. Mammal skinning

Cut along the dotted lines' but be careful not to cut too deeply into the stomach area, or the meat will be tainted.



Wild fowl

Wild birds can also be skinned, but if you need to retain maximum calories they should be plucked, as their fat stores lie just under the skin and can easily be lost in the skinning process. Plucking is easier when the bird is warm, but stubborn feathers can be loosened with hot water. Keep the feathers for insulation. If you're in a hurry, smaller birds, such as pigeon, can just be sliced open and the breast meat removed with a sharp blade. Larger birds should be roasted whole or jointed up into breasts and legs. Have a good look inside the birds' 'crop', a pre-digestive sac, to see what they've been eating as a guide to which bait to use in your trap line.

Fish

Any fish pulled out of the water will need to be gutted as soon as possible, as they spoil quickly. Squeeze their abdomen with the vent (anus) facing away from you to empty out their last meal, then slice them from vent to chin, being careful not to slice the internal organs accidentally. You'll need a firm grip because they're slippery blighters. Remove the internal organs and make sure the swim bladder (a thin membrane below the spine) has been pierced and removed. The fish can now be filleted for grilling or steamed in its skin and the flesh picked out once cooked.

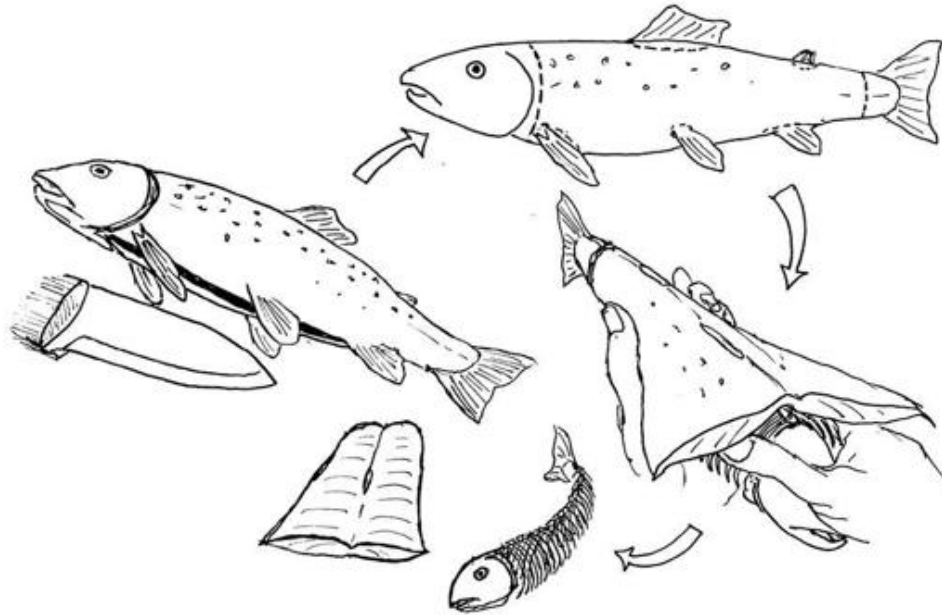
The skin of most fish can also be eaten but may have to be de-scaled first by running a blade from tail to head, lifting off the scales. Filleting the fish by removing the head, bones, tail and fins will leave just the flesh and skin, which are less likely to spoil too quickly and much easier to dry and preserve.

To fillet your fish, cut through the flesh just behind the gills, but don't cut through the backbone. Cut around the tail in the same manner. Slip your thumbs between the ribs and the flesh and slowly prize away each rib down both sides of the spine to loosen the skeleton. Large fish may need to be scored between ribs to free them. The head, bones and tail should now lift free, leaving behind only meat and skin.

Very small fish, once gutted, can be cooked whole, bones and all, to retain as many nutrients as possible. Certain types of fish may have to be skinned. The eel is one such slippery customer, and you will find this job easier if you fix the head to a post and use the pliers on your multi-tool to peel the skin off like a wet sock. Snakes should also be skinned in this way and have the head and a good portion of the neck cut off and buried.

80. Filleting a fish

From left, following the arrows: Gut the fish; remove the fins and cut around the tail and head; ease the flesh away from the skeleton. You will be left with a perfect boneless fillet.



Seafood

All shellfish and large crustaceans, such as crabs and lobsters, should be kept alive in salt water until needed, although this is by no means a long-term storage solution. Anything longer than overnight is pushing it for crabs and lobsters, though smaller shellfish can go a little longer. Without refrigeration, smaller shellfish must be cooked alive either in the embers or in boiling water. Crustaceans need to be plunged into fiercely boiling water to kill them and then cooked well for 10–20 minutes. It is possible to dispatch large crustaceans in the absence of boiling water. Crabs should be pierced through the face under the carapace, and lobsters can be stabbed through the top of the head where there is a handy 'X' that marks the spot. I normally stab then boil immediately, just to be sure. The good white meat will be found in the claws of both and the tail of the lobster. Some good brown meat can be found in the body of the crab, but remove the grey gills, stomach and mouth first. One top tip for handling these monsters prior to boiling is to avoid the pincers, but if you do get caught in their grip, push into it rather than try to pull away, which will probably be your immediate reaction. Their grip should then relax, hopefully ...

COOKING WITH YOUR CARRIED EQUIPMENT

There will be times when food must be viewed purely as fuel. Everything edible goes into a big cooking pot and gets boiled up as a survival stew, or what gets commonly referred to in the army as an 'all in'. This is often the least wasteful way of making the most of your rations: a warm, strange-tasting gloop, but with most of the calories kept intact, nothing wasted. Its advantage is that it needs only one cooking pot to make it,

needs very little preparation and is quickly made. It's easily eaten and, due to its 'baby-food' consistency, is quickly absorbed by the body. Army 'all ins' normally taste of curry, as this commonly carried powdered flavouring easily overshadows the weird combination of ingredients found bobbing around in the mixture.

Pre-prepared trail foods can be pretty sterile and boring (although very practical if you're on the move). However, with a bit of time on your side, imagination and creativity, your little stacking cooking pots can be combined with some age-old campfire cooking techniques and natural ingredients to rustle up any number of amazing morale-building meals.

Stewing and boiling

As long as a pot with a lid is available, stewing is an excellent method of retaining much of the goodness from your ingredients. Some of the tougher cuts of wild meat, such as the foreleg (and the front end generally), may well need to be stewed. Also, the wild cousins of familiar root vegetables will need to be cooked slightly longer to break down their 'woody' outer skins. Unconventional forms of protein, such as worms and insects, can be dried, ground up and slipped into a stew to provide much-needed nutrients.

Boiling is great for quickly dispatching shellfish and large crustaceans and for sterilizing water, but watch out that you aren't boiling a foodstuff for too long, which can destroy nutrients. Boiling will also release starches in energy-rich roots, which can then be sieved and dried as flour. After boiling vegetables, never tip the water away unless it's dirty with soil. Keep it for making a delicious gravy with any cooked meat juices and fresh herbs. Should you have dinner guests, you can really pretend you know what you're doing by adding edible wild berries to make a 'jus'.

It's extremely important to vary the cooking temperatures in just the same way as you would at home, so a carved pot hanger with varying height options is ideal. Even just moving a hanging pot to one side of the fire rather than directly over the heat will work sufficiently.

To thicken a stew and increase the nutritional value, add some flour made from roots, nuts or some dried and ground-up edible seaweed, if you happen to be near the coast.

'Browning' any meat before it goes into the stew by briefly frying or roasting it to seal in the flavour, and timing the addition of vegetables and wild fungi accurately so as not to over- or undercook them, are the marks of a true outdoor chef.

Frying

Billycans sometimes come with lids that become frying pans/skillets when turned upside down. The sort of thin stainless steel that is used for these lids/pans will benefit from a careful cooking technique over a cool fire or just embers to avoid scorching the living daylights out of your food and ruining the pan. Frying is a high-maintenance cooking technique that requires an energetic washing-up routine afterwards, but it has to be said that the smell of a cooked English breakfast of bacon and eggs or a backwoods burger drifting through the woods first thing in the morning cannot be

bettered. If you like fried food and you don't mind the extra weight, a well-seasoned black iron pan with high sides and a metal handle will be invaluable for cooking straight on the embers as well as making the aforementioned berry 'jus'.

Billycan baking

Making bread over a campfire is a valuable skill. Flour (the raw ingredient) can be carried in quantity without any fear of it going out of date (though you must keep it dry and well sealed) and is easily bulked out with any wild ingredients you may find while on your travels.

Metal cooking pots can be used in a number of ways to bake the perfect backcountry bread, but first you'll need to make the flour into a dough. Using the frying-pan/skillet lid from your billycan set, pour the required amount of flour out. This very much depends on how big the loaf is going to be and is impossible for me to indicate here, so trial and error will be your guide. Poke a finger into the centre of your mound of flour to give it the appearance of a miniature volcano. Pour in a small quantity of water, and begin to mix the flour and water together with your fingers. It should form a sticky mixture at first, becoming easier to pick up and move about as you knead it. If the mix continues to be too sticky, or even watery, add some flour. Likewise, if the mix is too dry, then add water in tiny amounts until a thick, doughy mixture is achieved.

As you knead this dough, add in any wild ingredients you might have collected. Torn wild garlic leaves and a few of the chopped and sweated bulbs make a delicious garlic bread that will repel any vampires for miles around. Crushed and winnowed edible wild seeds, greater reedmace pollen, partially roasted beechnuts or wild summer fruits are all fair game and will improve taste as well as nutritional value. Keep kneading the mixture, and, meanwhile, preheat your billycan over the fire.

For a suspended oven, lightly grease the warm billycan or dust the base with flour. Press your kneaded dough into the base of the pan, put the lid on top and suspend it above the fire. The heat must be kept low, and the best way to gauge the correct baking temperature is to hold your hand above the fire to test it. A count of 5 seconds before you have to remove your hand is about right. If it's still there after 10, then lower the pot or build up the fire. (It goes without saying that it must be down to your own judgement as to whether the fire is too hot to attempt this and when to remove your hand.) Keep a close eye on the fire temperature and the slowly baking loaf – you should tip the loaf out from time to time and check the base for colour and texture. Give it a light poke with a finger to see if it has started to firm up. Once the base is cooked, pop the loaf back in upside-down to brown off the top. The true test of a perfectly cooked loaf is to tap it. If the tap sounds dull and muffled, then carry on cooking, but if it sounds sharp and a bit hollow inside, then the bread should be perfectly cooked.

An improvised oven of sorts can be made with two nesting pots by putting your dough in the smallest pot and sitting it inside the large pot with a few pebbles between the pots to create airspace. Place the large lid on top of both and sit the pots on top of a bed of embers, shovelling more around the sides and onto the lid to provide a

regular but low heat from all angles, just like a normal oven. Little flatbreads can also be cooked like pancakes in the frying-pan/skillet lid of a billycan.

COOKING WITHOUT POTS

It's not all about the pots! There are plenty of ways to cook your food without them.

Skewering and ponassing

For bread, take a green, non-poisonous stick and scrape the outer bark away to remove any surface bacteria. Rotate the stick in the flames briefly to pre-heat it while also sterilizing it further. Roll your dough into a long sausage and twist it around the hot stick in a spiral, leaving small gaps between each twist. Hold or prop the stick up over the embers to bake. As long as your bread sausage isn't too heavy and thick, and is of the correct consistency, it will stay attached to the stick and bake in around 20 minutes over a temperature of 5-seconds hand exposure. Tap it for that telltale hollow sound, indicating a properly cooked bread twist.

The 'stick propped over the fire' method can also be used for skewered meat and fish. Large portions of meat can be cut into cubes and cooked quickly like kebabs. Small whole birds, such as wood pigeons, can be plucked and impaled on a sturdy propped stick, as can medium-sized fish. One of the better ways to grill filleted fish over the embers is to make a simple green-wood grill that holds the fish firmly and keeps it propped open while it cooks – a method known as ponassing. Angle it over the embers at the 5-second hand height and cook until the flesh turns golden brown. When cooking directly over the coals, the choice of firewood is important and will affect the taste of the meat, so use non-poisonous hardwoods. Alder, oak and fruitwoods will add a delicate smoky flavour. Resinous woods, such as pine, will make it taste of turpentine!

Planking

Wood can also be used as a surface to cook on next to the fire. Cut a log from a green hardwood that splits easily, such as willow or ash. Avoid resinous woods, such as pine, and never use poisonous woods, such as yew or holly. Split your log straight down the middle and, using some little chisel-point hardwood pegs, fix the splayed fish or meat to the flat plank side of the log. The chisel-tipped pegs must be hammered in line with the grain of the wood. Then, simply angle your log next to the fire to cook the food. This works especially well with thin meat, such as bacon, and fish, and can even be used with sticky dough to make flat breads.

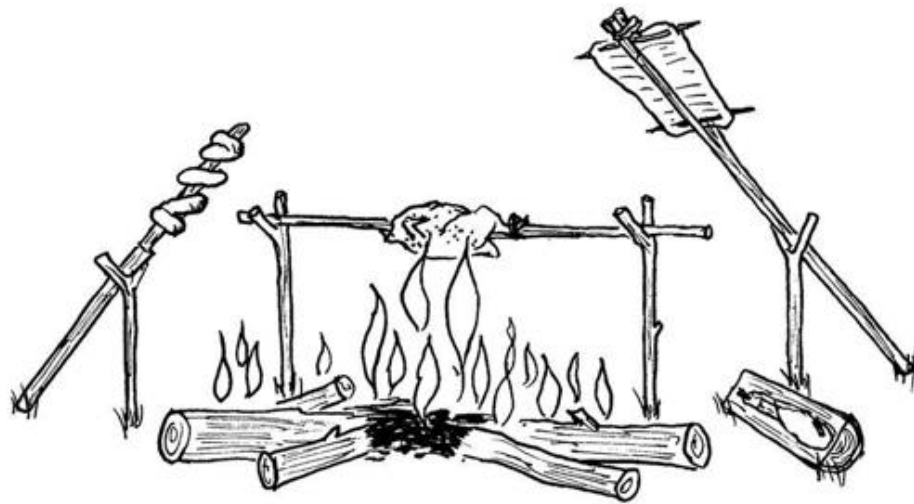
Spit-roasting

This is probably the most visually exciting way of cooking meat, but also quite wasteful, as valuable fats in the meat will drip away during the cooking process, burning in the fire below. The best way to overcome this is to have two roasting fires

either side of your spit and some sort of improvised drip tray underneath the cooking meat to collect the fat. This can be re-used to baste the meat continuously and stop it drying out. Spit-roasting is also a method that requires a massive supply of firewood, especially for large beasts. Even a medium-sized deer will take around 4–5 hours of basting and turning before it's properly cooked, because the key to culinary success is to resist the temptation to engulf it in an inferno, instead roasting it slowly over embers for a slow, even heat.

81. Several methods of cooking without pots

From left to right: Bread dough is twisted around a stick; a wild bird is spit-roasted; bacon is fixed to a split log on the ground with wooden pegs; a filleted fish is poached over the embers.



Steaming

Steaming retains the most nutrients of any method. Wrap your food in large edible leaves, avoiding extremely toxic large-leaved plants, such as foxglove. If cooking meat, you can stuff it first with wild herbs to give it a subtle flavour. Wild garlic, sorrel and hairy bittercress are a few of my favourites. Lay a good bed of damp moss or seaweed straight on to the embers, place your wrapped parcels on top and cover with more damp moss and a shovelful of embers to top it off. Clay can also be used to encase the parcels, but take care in case they burst during cooking. Leave the parcels to steam in their own juices for 1–2 hours – the timing isn't crucial as they can't really be over-steamed. This method works well with fish, small cuts of meat, roots and shellfish, which don't need to be wrapped in parcels, steaming nicely in their own shells.

Cooking in the ashes

Such a primitive cooking technique that you would be quite within your rights to shout “ugg” and beat the butt end of your flint-tipped spear on a mammoth tusk. No specialist cooking equipment is required at all for this, other than a fire. Simply scrape back your fire slightly to leave only hot ashes and place your food amongst them to

cook. Any obvious glowing embers should be removed, as food in direct contact with them will burn. The stored heat in the ground and surrounding ash bed is what cooks your food. Large edible roots such as cattail (greater reedmace) and burdock can be cooked in their own skins, the technique being to open up the hard outer rind and suck the starch from the steamed fibres within. Smaller roots, such as lesser celandine, thistle or silverweed, are just brushed free of ash once cooked and eaten whole. Simple flat breads can be cooked amongst the ashes, earning them the name of 'ashcakes'.

Shellfish, large and small, cook well in their own juices with shells turned upside down and seated in the hot ash, and even eggs can be successfully cooked by piercing a hole in the top and hard boiling them in their own shells. By the way, the hole is vitally important as a pressure-release valve to stop an almost guaranteed egg explosion. Large eggs can also be cracked open straight onto the hot ground, after your fire has been scraped out, to make an ash omelette, which is tastier than it sounds. With all these methods, ensure that you brush any excess ash away from the cooked food as you really don't want to ingest any unless you absolutely can't avoid it.

Cooking using hot rocks

Rocks, when heated, retain a lot of heat for a long time. However, you must avoid overly wet rocks and certainly never use glassy or flaky rocks, due to the risk of explosion. All rocks contain some moisture, even though they might feel dry to the touch. Excess water will potentially make a rock burst open with the pressure of the rapidly heated moisture within, causing red hot shards of rock to fly around like shrapnel. Choose dry, smooth, solid rocks and heat them gradually by placing them around the fire, moving them inwards slowly.

A large flat rock kept next to the fire can be used like a hot plate to cook flat breads and similar food, and small round pebbles can be heated and dropped into a waterproof container to boil the liquid internally. This is useful if your waterproof container isn't fireproof. Brush off any ash before dropping the hot rocks in and always use a set of improvised wooden tongs or a shovel to handle them, as they can be deceptively hot – certainly hot enough to burn the flesh from your hands.

My favourite method of hot-rock cooking is to dig a hangi pit, which is a form of underground oven crossed with a pressure cooker. First, dig a hole just deep enough for the food you intend to cook plus a bed of hot rocks and about 25cm/10in of extra space above. Firm, almost clay-like soil is best. Sandy soil will do, but avoid damp ground, as this will draw most of the heat away from your rocks. Obviously avoid potentially flammable ground such as soil heavily interspersed with roots or peat and clear away any tinder-dry ground cover and surrounding vegetation.

Lay a raft of strong, dry fuel wood across your pit and build a fire on top. Keep adding fuel wood to the fire, and, once it becomes well established, add enough rocks to eventually line the bottom of the pit. Let the fire burn down into the pit, where it should burn away to embers, heating the inside of the pit and the rocks. Shovel the embers out and place your food parcels straight on top of the hot rocks. Large pieces of meat won't need to be wrapped. Arrange the rocks so that some sit on top of the food, then seal up your pit using a framework of sticks and a woven grass mat, carpet

of moss or large leaves. The excavated soil should then be shovelled back on top to cover the improvised lid and seal all the heat and moisture inside. Cooking times will obviously vary and will be confirmed through trial and error, but I have frequently found that two whole haunches of venison will be cooked to perfection in just under 2 hours if the ground is good and the rocks are heated until starting to give off little sparks.

Note that it's extremely important to mark the location of your underground oven to stop other group members blundering into it accidentally, even once the food is cooked and removed.

These primitive and improvised methods of cooking can be used quite happily alongside conventional pots and pans, extending your range in a fixed camp and lightening your kitchen load. Some can be set up and left to cook the food while you get on with other jobs. Many are still in regular use today all around the globe, and in my opinion the hangi oven is THE only way to cook dry meats such as venison and pop them out the other end, moist and perfectly cooked. Better than any modern fan oven.

PRESERVING FOOD

Assuming that you don't want to eat all your food in one go, the lack of a fridge or freezer in the wilderness suddenly becomes apparent. Once again, we must fall back on traditional knowhow for the answer. In extremely cold climates, keeping food cool or even frozen isn't so much of a problem, other than to keep it out of the grasp of hungry scavengers. However, in a temperate climate, almost immediate steps should be taken to prolong the life of any perishables. Meat, especially, will begin to decay very quickly in a warm, moist environment.

One temporary solution is to seek out the coolest place in camp. This can be a permanently shady area with a cool breeze blowing through, or, even better, a source of running water. Presuming you have enough watertight containers in which to store your food under the water and stop it becoming a lucky lunch for the fish, this should provide an almost fridge-cool environment. Don't forget to tether it well to the bank!

If you have a secure insect-proof net, then a temporary hanging larder is easily made. Suspend the larder up off the ground in a cool, shady place, using sticks to prop the netting out and ensure that the flies can't buzz their way in to, or even close to, the food. Damp cotton material draped over the larder will keep the contents slightly cooler due to the evaporation process, but you will need to keep the material continuously damp somehow.

Whilst effective and certainly better than doing nothing at all, these actions will only slow the inevitable decay of your food supplies.

Smoking

The backcountry smoking of meat isn't really a long-term preservative measure, but a smoky environment does help in the eventual drying of meat, fish and other perishables and helps to keep egg-laying insects away. If you happen to be in a static camp with a constantly smouldering campfire, then the easiest answer is to hoist your

food up into the smoky eaves of any overhead cover, or wherever the campfire smoke seems to collect, until you need it. Here it should become well dried and coated with a protective smoky patina, which will ensure that it keeps for longer. It must never get so hot that the fats in the meat begin to melt and drip, and care must be taken to ensure that poisonous wood is never used on the fire. Historically, in some communities resinous pinewood was burnt to coat the meat in an impenetrable layer of wood tar-impregnated smoke, but I can imagine this would taste like biting down on a creosoted fence panel.

Drying

Drying is one of the earliest methods of preserving food to see a hunter's family through any lean times and to make use of an excess of foraged or hunted goods. Forcing out the moisture also reduces both weight and bulk considerably, making dried food the perfect choice for the lightweight wilderness traveller.

In hot countries, the sun will be your drying medium, and any meat left out in it will soon shrivel up. In more temperate climates, a warm, dry atmosphere will need to be artificially created under cover to dry the moisture from the meat. The trick is to cut your meat very thinly so that it dries quickly before getting a chance to decay. Fruit (not citrus types) and wild fungi should also be prepared in this way, and fish can be opened out flat, left in their skins with the flesh scored for speedy drying. In a fixed camp, meat, fish, fruit and fungi can all be skewered and suspended above the campfire to dry (but not cook). Despite considerable shrinkage, all the calories and goodness are retained, and any sugars remain concentrated in the fruit ready to be reconstituted by soaking to become as good as new. While the fungi and fruit may need to be soaked for at least a day to regain their bulk, dried meat can be eaten as it is, although it'll take some chewing. Make the eating experience more pleasant by rubbing in some herbs and flavourings before hanging the meat up to dry.

Dried meat can also be made into pemmican, an energy-loaded foodstuff that provides maximum calories for its light weight. Historically, this was perfect for anyone needing to travel fast and light but carry many days worth of food supplies, from early Native American scouts to the Polar explorers of more recent times. The meat is pounded and ground up along with dried bone marrow, mixed with the same amount again of animal fat and dried berries and rolled into little balls. These 'all-in-one' meals are traditionally kept sealed in rawhide bags, away from the damp, and remain edible for an amazingly long time, even years. They can be eaten raw or added to other food found on the trail.

CORD CRAFT

Making string and rope from natural fibres

The ability to make cordage and to harvest suitable binding materials is more valuable than you might think. If you were to browse back through the chapters of this book, I can guarantee that you will find a mention of string, cordage, cord, fishing lines, guy lines, bindings, even shoelaces hiding amongst the words of each one. Cordage is an ever-present component of survival training, and therefore it is vital to know how to use the cord you might already have effectively, and also how to manufacture a strong replacement if a manmade option isn't available.

Using shelter construction as an example: wherever possible, the use of cordage in the construction process is avoided by careful selection of timbers with natural forks, but occasionally a strong lashing is required, often causing the builder to sacrifice something stringy from their own equipment. A knowledge of which natural resources can serve as a strong binding material is crucial here, as once a shoe lace or trouser waist cord has been built into a shelter framework, it'll never be seen again, and the shelter occupant will be forever identified by their stumbling, tripping gait and loud cursing. Also, strong bindings and lashings are essential for joining two or more sections of wood when getting down to a bit of backcountry carpentry. Chairs, tables, benches, sideboards can all be rustled up with a sound knowledge of knots and lashings and a good idea of where suitable fibres can be found.

Rough-and-ready bindings and lashings are important, but what about the finer things in life? Twisting the right kinds of plant fibres to make neat lengths of cord will assist you greatly in the construction of a hair-trigger trap or a primitive weapon for keeping the larder stocked. Grass mats and coiled baskets can be woven for various jobs around camp, and the production of never-ending ultra-thin line is possible for use in the making of nets and fishing equipment.

ROUGH BINDINGS

Binding material doesn't need to be quite as flexible as string or cordage. In some cases, its semi-rigid nature is beneficial to the task. Lashings on cooking-pot tripods, weight-bearing camp furniture and certain trap types are good examples. A typical binding material is quickly and easily harvested, needing very little preparation to make it usable. It blends in with the environment perfectly, lasting just as long as the other natural materials being used, eventually becoming food for the beetles.

Withies

Most deciduous woodlands will have materials that can be made into withies. These ingenious traditional bindings perfectly represent the ethos of the woodsman working in harmony with his natural surroundings. A long, thin sapling or branching shoot is

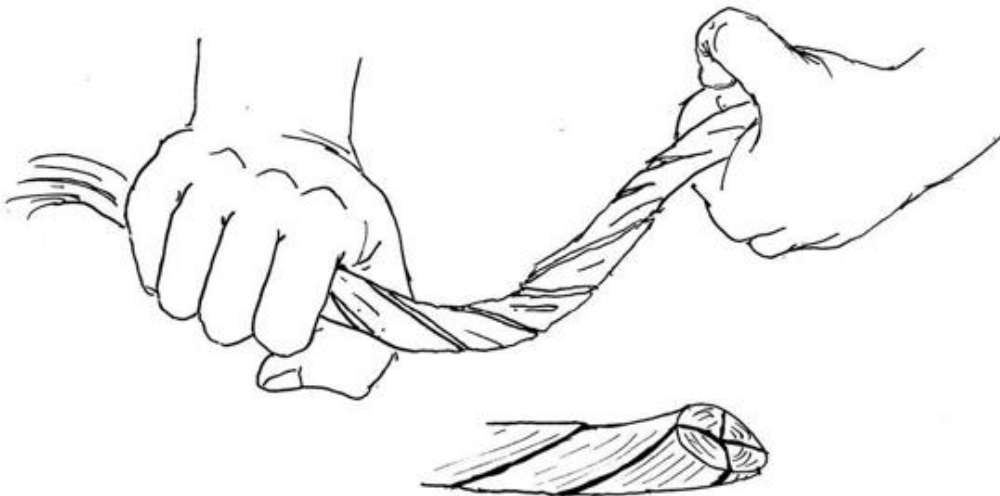
selected from a species known to have flexible fibres. Willow, sweet chestnut and hazel are prime examples, being trees that commonly send up long, straight shoots from a coppiced trunk or fallen branch. These shoots will often form the main components of crafts such as basket-weaving and hurdle-fencing, which require bendy lengths of wood. These trees are also fast growers and can quite happily cope with having living shoots removed, as long as the pruning is done responsibly.

Look for the longest-growing shoot you can find, reaching up towards the sun. Avoid any with obvious kinks or significant off-shooting branches. Leave it attached to the main trunk, if possible, and, with a firm grip, start twisting at one end. Heavy-duty tasks require heavy-duty withies, but don't attempt to twist one thicker than your own thumb unless you've got the arms of a gorilla! Keep twisting the shoot in the same direction, feeling the individual fibres separate from one another with a little 'popping' noise. When you've wound a section to the point where it's looking at risk of snapping completely, carefully move along the shoot and continue your twisting in the same direction as before. Continue all the way along the shoot until the whole length has been twisted to separate the fibres without breaking them, then cut it free from the main trunk. (In winter, when the wood is less flexible, you might find this harder, but not impossible.)

A smooth withy-twisting technique takes time to develop, so keep at it! Someone I know uses his whole body to perform imaginary twisting judo throws while gripping the sapling tightly. Eventually, once his invisible opponent is well and truly defeated and on his way to a make-believe casualty department, the withy is well twisted and ready to lash something. Unfortunately, though, he hasn't got the energy left to tie the lashings.

82. Twisting up a withy

Notice how the fibres are splitting away from one another but staying intact along the withy's length, turning a stick into a bundle of thinner individual fibres, thereby making it much more flexible.



Roots

The roots of certain coniferous trees are extremely flexible and have been used for thousands of years to sew bark and lash up wood. Spruce is the most well-known and well-used root, but any coniferous tree is worth trying. Silver birch can also be used if you happen to be in deciduous forest. You're really searching for the thinner 'rootlets' shooting off from the larger, more obvious, roots. These need to be around 2–15mm/ $\frac{1}{16}$ – $\frac{5}{8}$ in to be usable, and they weave their way through the soil not too far below the surface. With a sharpened stick or the heel of your boot, dig around until you find one, which shouldn't take too long as the surface soil in a coniferous woodland is usually fairly loose. Once located, carefully continue unearthing it until you find either its source or the spindly end. Impatient pulling will only succeed in revealing half a snapped root. Be wary of taking too many of these rootlets from one tree. They do have a purpose, and while the tree can spare a few it would be thoughtless to steal the lot!

These roots need no twisting to separate the fibres, as they're flexible enough straight from the earth. You may want to work any particularly stiff sections gently, as these can become a weak point, likely to snap when pulled tight around a corner or sharp bend. Roots can dry out fairly quickly once removed from the ground, becoming less flexible the drier they get, but can be 're-hydrated' again by soaking in water. The same is true for withies. Boiling water makes them really pliable!

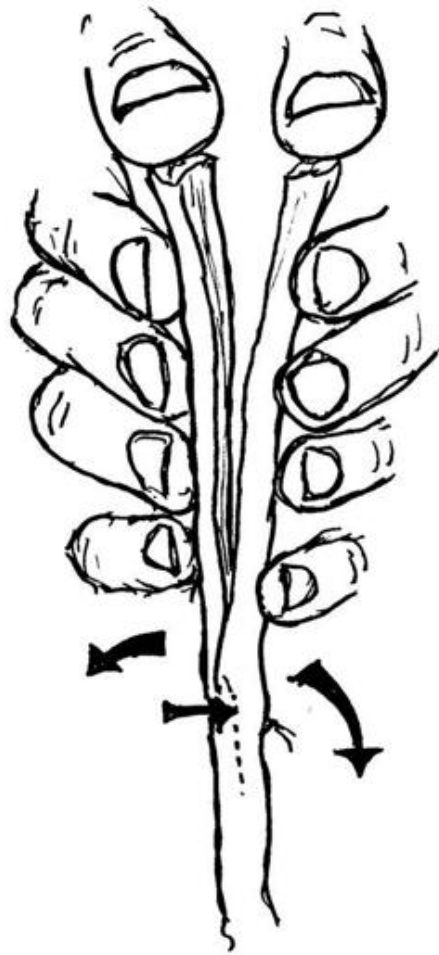
Be prepared for rough lashings tied with freshly gathered roots to become slightly loose as they dry and shrink back. For finer work, where a root lashing is on show and must remain as tight as possible, they can be processed further still. Scrape the brittle outer bark from the entire root by pulling it through two semi-sharp wooden surfaces or by using the back of your knife. Underneath it will be smooth and buff coloured. For really neat, strong lashings, split the root in half along its length to provide a flat side, which can be pulled tight against the work. It should also be dried and then slightly re-wetted before use in just the same way as basket weavers treat their stored willow bolts.

SPLITTING ROOTS

To split a root, begin by carefully slicing into the end with a sharp blade to cleave it perfectly in half. Grip both halves of the root between the thumb and forefinger of each hand and gently pull to separate the two halves. At some point (probably fairly soon after starting) one half will start to taper off, eventually down to nothing, leaving you with a fairly useless length of root in one hand. This can be corrected by pulling only on the thicker half as soon as you notice the unequal tapering. When the split comes back to the centre, pull both halves evenly again. The whole root can be carefully divided in this way along its length. If the root's quite thick and your fingers pretty nimble, you could even split it down thinner still. To increase the flexibility of any root or withy, run it back and forth around a wooden post to break down the woody fibres without snapping it.

83. Roots can be split by carefully pulling them apart

If the split wanders off, focus your pulling on the thicker side until the split becomes central again.



Animal hide

One of the many byproducts of hunting and trapping, animal hides are incredibly useful for a wide range of applications. Rawhide is the name given to animal skins that have been scraped of flesh and dried but not cured or softened. As rawhide, they make an excellent binding due to the way they shrink as they dry. Plant fibres retract individually, making the binding turns shrink and leaving gaps where they were once pulled tight. Rawhide, however, shrinks as a complete unit, meaning that lashings and bindings tighten further still around the work.

Furs and thick hides should always be used for clothing and bedding first and foremost, but any hide scraps or ruined skins can be set aside for your binding needs. The beauty of using hide, other than its strength, is that you can produce a continuous long length by carefully cutting in an ever-decreasing spiral. Stretch the cut length out while it's still damp and the fibres will re-conform as it dries to become a straight and very long line. For rough bindings, the hair can be left on, but for finer work, such as securing a spearhead to a shaft or laying up into a strong cord, the hair should be removed. To do this, leave the hide soaking in a thick, sludgy solution of wood ash and water for a minimum of 3 days, after which the hair should slip out easily. Don't be

too vigorous in your removal of the hair, as you want the 'grain' (second layer of a skin, under the epidermis layer) to remain intact for added strength. A rawhide lashing will soften again as it gets wet but can be waterproofed to a certain degree by covering it with pine resin or birch tar. Even a forced smoking over resinous pinewood will help.

Inner barks

The soft, flexible inner barks (sometimes called 'bast' or 'phloem') of many trees can be used to make a rough binding. Lime, willow, cedar and elm are all suitable but can only really be successfully harvested in the spring or summer months, when sap is flowing freely. Select a long green limb with very few off-shooting branches and cut it free from the tree. The limb must have a smooth outer bark so will need to be fairly young. Some fallen trees that are still growing, sending new shoots straight upwards towards the light, are perfect for this. Immediately slice through the outer and inner bark for the whole length of the limb and peel it from the sap wood like a bark jacket. This will be pretty wide when opened out flat and quite flexible while still fresh. For rough bindings, it can be sliced into thinner lengths and used as it is, but will be a lot more flexible and less brittle if you take the time to process it further by removing the thin outer bark. Scrape this away using the back of a knife or similar semi-sharp edge.

KNOTS AND LASHINGS USING ROUGH BINDINGS

Twisted sapling, root and inner-bark bindings require some pretty rough-and-ready knots, too. These hitches and half hitches are uncomplicated but effective, and complement the rustic binding materials perfectly. Hitches should be avoided if using damp rawhide in a lashing, as it could slip undone if needed to bear weight while still wet. However, it is flexible enough to use for some of the more elaborate and secure knots shown later.

Clove hitch

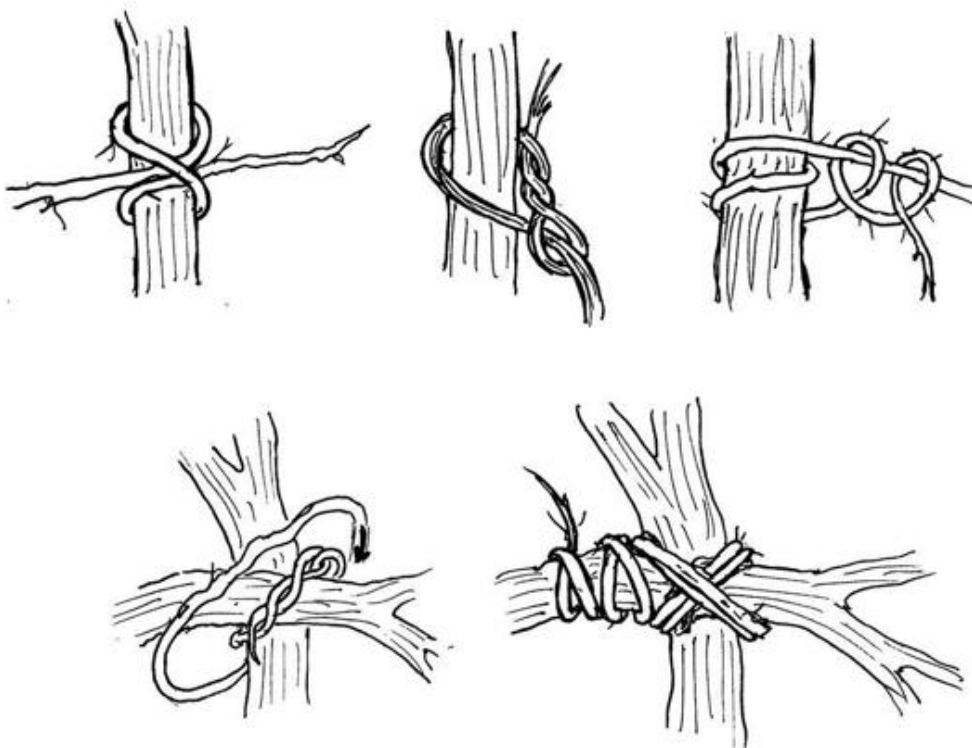
An uncomplicated knot for securing cordage to a post. Also used in net-making and starting off a square lashing.

Timber hitch

About as simple as you can get in the knot world. Just make a loop and wind the running end around, so that when pulled tight the knot is jammed against the post. (The running end is the active part of the cordage used to tie the knot.) Must be kept under strain, so perfect for starting a very simple diagonal lashing using rough binding materials.

84. Rough bindings, knots and lashings

From left to right: (top) clove hitch; timber hitch; round turn and two half hitches; (bottom) two stages of a simple diagonal lashing.



Round turn and two half hitches

Very simple but solid knot to secure a binding to a post. The two half hitches are the best way to finish any simple lashing using rough bindings. Just wrap around the post, tuck the running end through the turn, pull tight and keep repeating until you run out of cord.

Simple diagonal lashing

This lashing is perfect for using with natural binding materials that tend to be quite short in length. Start with a timber hitch and use the remaining length to diagonally wrap around your joined spars, pulling the turns nice and tight, first one way, then the other, finishing with at least two half hitches.

SUITABLE FIBRES FOR CORDAGE

There are many fibres to be found in the natural world that can be made into string and cordage; some already look pretty stringy, others look completely unlikely. For plant fibres, the length of the raw materials will obviously be important, so tall plants will be first on the list. The fibres also need to exhibit some basic characteristics in their unprocessed form, such as being able to bend quite dramatically without snapping. I like to wrap a couple of fibres around a finger and give them a little tug to see if they break. This provides a very rough gauge of how they will behave under

load and when being used to tie knots and lashings. Once you know what sorts of fibres to look for, you'll be extremely unlucky if you can't find similar substitutes in other parts of the world.

The list of what is suitable is quite extensive. These are just a few of them.

Nettles and brambles

Gather nettles using gloves and pull through a clenched fist to remove the stings and leaves. Bramble stems should be pulled under the stiffer sole of a boot held against a log. Gently pound the stems to release the fibres and soften any stiff or spiky bits. Open the stems out flat and lift the stiff pith away from the outer fibres. Dry these outer fibres before slightly re-wetting to make into cordage. If the fibres are used when freshly stripped, the cord will be weaker. Both make surprisingly strong string for their size.

Cattail stems and honeysuckle bark

These are both quite flimsy, papery fibres that need careful grading and an attentive cordage-maker to produce a strong material. The outer layers of these plants naturally peel away without any extra work, and as long as you use the already dead fibres, they won't need drying before being slightly dampened and twisted into a soft flexible cord or cordage.

Inner barks

Although inner barks require a little more processing than other fibres, it's more than worth it because they produce an extremely strong but soft material that also has the advantage of needing fewer joins due to its long lengths. Lime trees have a long history of being a tree that can produce excellent fibres. Willow, sweet chestnut and oak are also good.

To harvest the fibres, a long strip of bark must be removed from the smooth trunk of a young tree, and if this is done carefully, taking only a strip but not cutting off the flow of nutrients by 'ringing the tree', it will survive. However, due to the potential tree damage, this must be considered only as a survival option. Alternatively, fell a small tree or prune a sapling, use all the bark for cordage and the wood for other projects. In the summer months, inner and outer bark comes away very easily after being scored through with a sharp blade and prized carefully away from the tree. To extract the inner bark fibres, just scrape away the thin outer bark with a dull blade. Older, thicker bark may have to be soaked for a period to give up the fibres, a technique known as 'retting'. All inner-bark fibres must be dried for storage then dampened before use. Sometimes a fallen, dead lime or sweet chestnut tree will have completely intact, already dry fibres lying just underneath the easily removed bark.

Roots

As previously mentioned, these are a strong and flexible resource found at the base of many coniferous trees. To be twisted into string they must have the bark stripped and

be split down, although I prefer to use these half-round lengths for plaiting strong straps instead of rolling round-section cord.

Hide, sinew and gut

Animal hide, once processed into rawhide, can be dampened and made into one of the strongest cordages in the natural world. For quick and simple jobs like the cordage for a spring snare, it doesn't even need to be laid up into a two-ply cord, as it will conform to a round cross-section if stretched and twisted while damp then left to dry while still twisted and under tension. However, it must be made waterproof in some way, either by a forced smoking over resinous woods or the application of wood tar or animal fat, as it becomes slippery and stretchy again when wet.

Sinews found in the lower leg and back of most decent-sized animals are easily the strongest fibres for their size. Back sinews can be removed in a wide strip from the lumbar area and are easy to separate out into individual fibres. Leg tendons are more tubular in cross-section and shorter, but a little bit stronger, and require some pounding to separate the fibres. Both can be dried until needed, and, when dampened, develop a sticky coating, which helps to bind the fibres together as they dry. This quality makes them perfect for small binding jobs, such as fixing a flint flake to an atlatl dart and also as a strong sewing thread.

Animal intestines can also be used as very fine but elastic cordage, shrinking as it dries. Gut from the polar bear and bearded seal was even processed and sewn together with whale sinew to make waterproof parkas for the kayak hunters of Alaska.

MAKING CORDAGE

There are several methods for producing strong cordage. The aim is to combine fibres, joining them in such a way that they become stronger than the individual fibres themselves. Strength in numbers! By ensuring that the fibres are joined in equal amounts in a consistently uniform manner along the entire length of your cord, you should lessen any weak or vulnerable areas. All natural fibres have brittle bits or thinner sections. This is normally where they fail when put under tension. Processing the fibres well reinforces these weak areas and increases the overall strength.

Laying by hand

This method is ideal for two-ply cordage of any size. The principles stay the same whether you're making thin fishing line or sturdy rope. First, slightly dampen the fibres to make them easier to work with. Take a bundle about half the diameter of your intended cord. Pick it up in the centre and hold it in a pinch grip between the thumb and forefingers of each hand, with a 5cm/2in section pulled tight between both hands. Roll the fibres held in your right hand between thumb and forefinger so that they twist together (licking your finger tips will give them more grip). Hold the fibres in your left hand firmly without twisting. Very soon the twist will become as tight as it can go before kinking up. Let this kink happen, and grip the resulting twisted loop between the thumb and forefinger of your left hand. This kinked loop forms the starting point of

any cordage rolling method, with one half of your fibre bundle beginning to twist in one direction and the other half starting to twist in the opposite direction. These opposing twists are what lock the structure together and stop it unravelling. You should now have the kinked loop held in a pinch grip in your left hand and two strands, roughly equal in diameter and length, lying in the upturned palm of your right hand, ready to begin twisting.

This is where it gets fiddly, but stick with it! Grip the top strand between the thumb and forefinger of your right hand while also securing the lower strand between the second and third fingers of the same hand to form a 'Y' shape. This should ensure both are held tight and kept taut. Using thumb and forefinger only, perform the same rolling twist on the top strand as previously, twisting away from you. Twist until the fibres are as tightly twisted as possible, then rotate your whole right hand back towards your body, keeping all the fibres pulled taut between both hands. The top strand now becomes the bottom strand, and the bottom becomes top. Shuffle your left hand along the cord slightly to apply your pinch grip to the newly twisted section, securing it and briefly let go of the two right-hand strands and return your right hand back to its original position, re-gripping both strands in their new positions as before. (Your actions on this first section should have resulted in the tight twists on the top strands being 'locked' into position by taking the untwisted strand back over the top in the opposite direction. Briefly letting go shouldn't matter too much, as the twists should remain twisted.)

Now repeat the process, twisting the (new) top strand away from you while keeping the bottom strand pulled taut, then rotating your right hand towards you again to lock the twists in place with the opposing strand. Move your left hand along the cord as you go, gripping the new twists and keeping the gap between your hands small for better control. Continue alternating in this way, and before too long you should have a short length of line that looks and feels exactly like the modern string we know and love. What feels fiddly at first will very quickly become a fluid motion that needs very little thought.

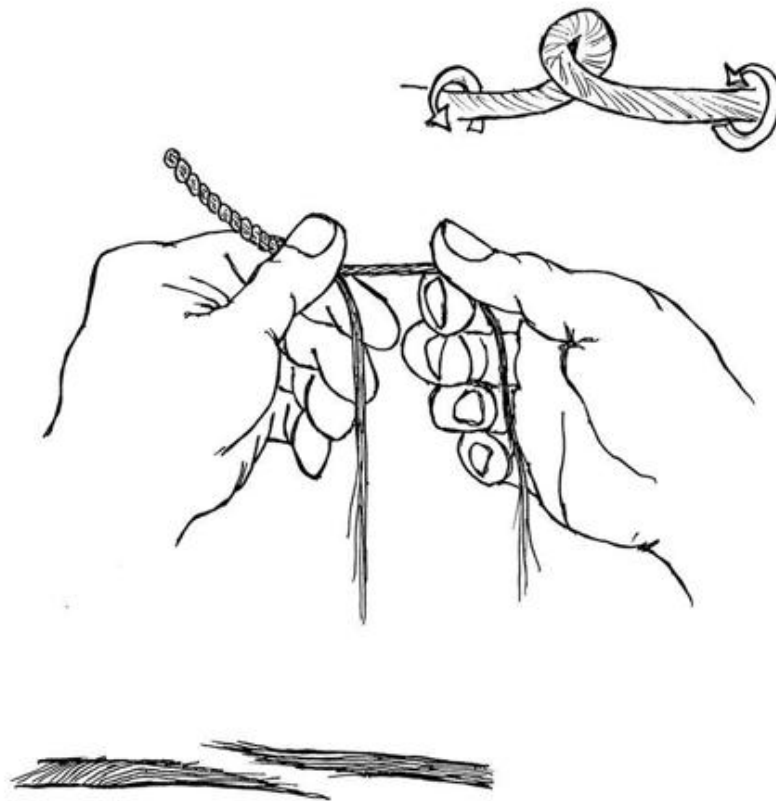
Larger cord or rope would be made using thicker bundles or strands, but will involve a different grip, using more fingers and a lot more wrist action. Start small, and move onto larger diameter cordage only once you get the hang of it.

85. Twisting cordage

Top: Twisting to make a kinked loop is the starting point, leaving each strand starting to twist in opposite directions.

Middle: Keep all the strands taut as you twist, and aim for uniformity along the length.

Bottom: Tapering your joins will ensure that the cord remains exactly the same thickness all the way along – the secret to its strength.



Adding in fibres

Eventually, you will reach the end of your strands or thick bundle of fibres. You can carry on adding in more fibres indefinitely to make your length of cordage as long as you need. All you need to do is lay a new length of bundled fibres alongside the old ones and twist them both together. This is done with both top and bottom strands individually. The trick is to stagger your join to 'spread' the load on any weak points, making them less of an issue. Add into the top strand and then a bit further up add into the opposite strand.

Pay close attention to the consistency of the cord's diameter overall, as any thinner sections along its length will become a weak area when under tension. With a laid cord, the secret to its strength lies in its constant uniformity. Consider this as you add your new fibres, and taper both sides of the join so that, once combined, the diameter remains the same. When you decide that your cord is long enough, tie an overhand knot in the end to secure the strands and stop them unravelling.

Rolling

Rolling the cordage fibres on your thigh is just another method of producing the same type of two-ply cord as above. Treat your fibres in the same way by re-wetting them slightly for a better grip, producing the initial kink that starts the twisting process,

keeping a consistent thickness throughout and adding in new fibres by laying them alongside the tapering strands. Keep the joins staggered, though!

Once you have your kinked loop, pinch it in a thumb and forefinger grip above your thigh, with the two trailing ends produced by doubling the cord over lying across your thigh. Lick your right palm and simply roll both sets of strands away from you along the thigh, slightly pulling the cord away from your thigh with your left hand to keep all the strands taut. Both sets of strands should naturally twist and stay locked together. This is a much faster method than hand laying, but slightly less exact and prone to inconsistencies until you get more experienced. It is also only achievable with thinner cordage. Hairy-legged people who wear shorts: be prepared to go through some serious pain during this process!

86. Twisting cordage fibres using the thigh and palm

Rolling cordage on your thigh is a quick way of producing lots of thin cordage. Start in the same way as for laying cordage, with a kinked loop, and keep all the strands taut as you roll.



Plaiting

This is a very easy method of producing cordage that is flatter in section than laid or rolled cordage, so perfect for straps and belts. Take three equal-sized bundles of fibres, or single strands, and lay them side by side. Fasten all three together at one end with an overhand knot, then slightly spread all three apart. Take the right-hand bundle or strand and bring it across the middle one to lie in between that and the left-hand strand. Now take the left-hand strand and take it back in the opposite direction, crossing what is now the middle strand, and place it down between that and what has become the outside strand on the right. This right-hand strand is now brought back across the middle and placed in between that and the left outside strand again, and so

it goes on until you have the length you need. Adding in new fibres can be done in the same manner as described for two-ply cordage above, but allow for a longer overlap on the join and don't forget to stagger all three.

87. Plaiting flat-section cordage



KNOTS AND LASHINGS

There are many knots that can be tied for many different tasks. Since I started down this road about 24 years ago, I've only ever used the same group of knots for everything. Some really good adjustable, slip and quick-release knots can be found in the shelter chapter. These are my other 'do almost everything' knots and lashings.

Reef knot

A very easy, quite flat knot for tying cordages of the same thickness. It's easy to untie, too. Tie an overhand knot or two half hitches in either running end just to be sure it doesn't come undone.

Overhand knot

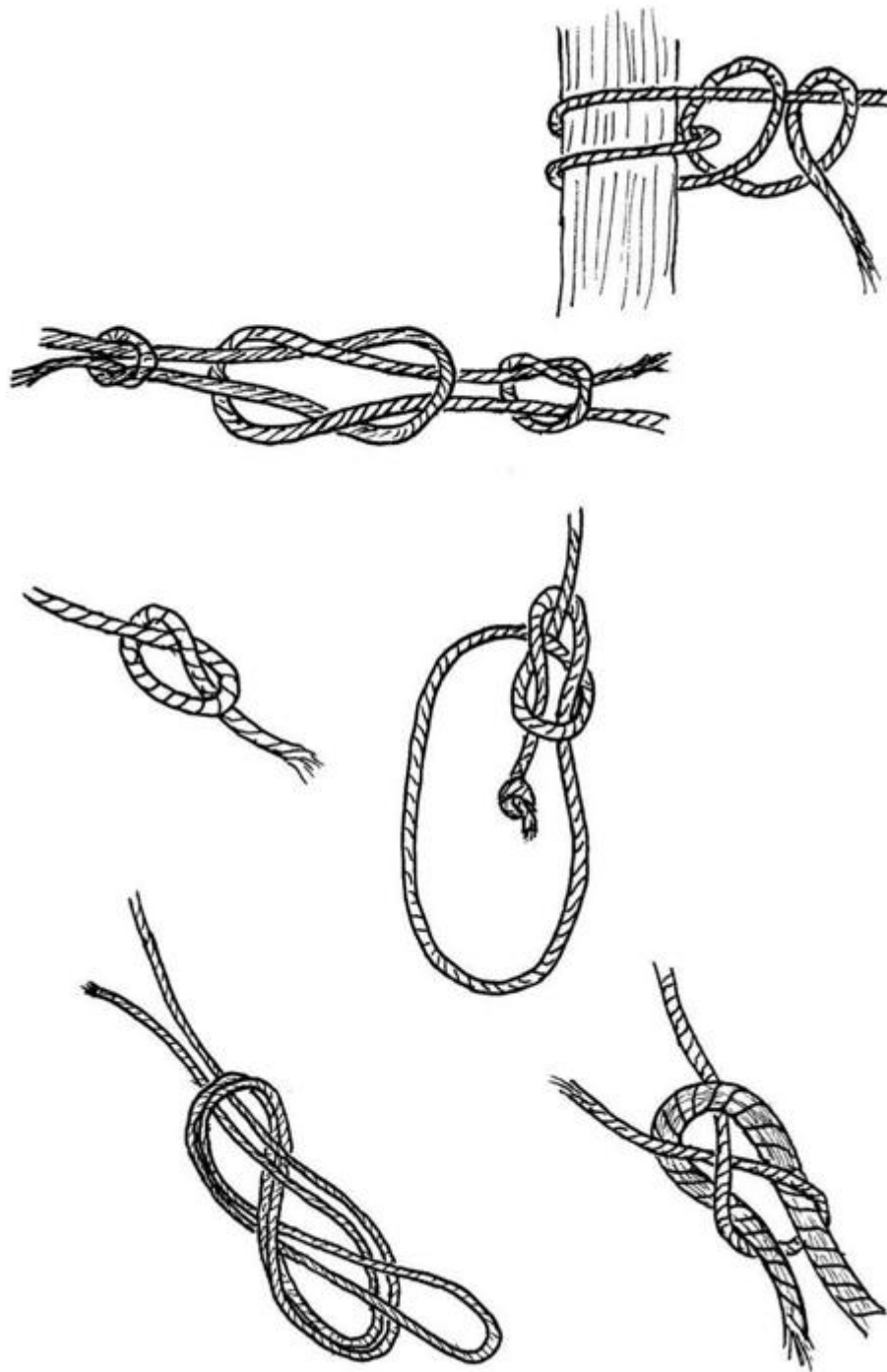
Also known as the 'thumb knot' (I often refer to it as a thumb knot when it's tied at the end of a line), this is a very simple and easily tied knot that can be tied in the end of a length of cordage to prevent fraying or stop it slipping through an eye. It can also be used to stop the running end pulling through on other knots, as a safeguard to stop them slipping undone. Two pieces of cordage can also be tied together to hang side by side by tying the same knot using both strands.

Fisherman's bend

For securing to a post. Good for boats, as it has some 'give' in it when pulled. I use it to tie spring snare cords to saplings for that reason.

88. Knots using cordage

Top from left to right: reef knot and reef knot, fisherman's bend
(middle) overhand knot and bowline
(bottom) figure-of-eight loop and sheet bend



Bowline

A well-known knot used to make a non-slipping loop in the end of cordage. This makes it a good one for climbing. A thumb knot in the running end (shown) will keep it from pulling through if your cordage is a bit slippery.

Figure-of-eight loop

Another very easy way of making a secure, fixed loop in the end of cordage. Use the same figure-of-eight knot in the end of a single line to make a more secure version of the overhand knot.

Sheet bend

Used for joining cordages of different thicknesses.

Square lashing

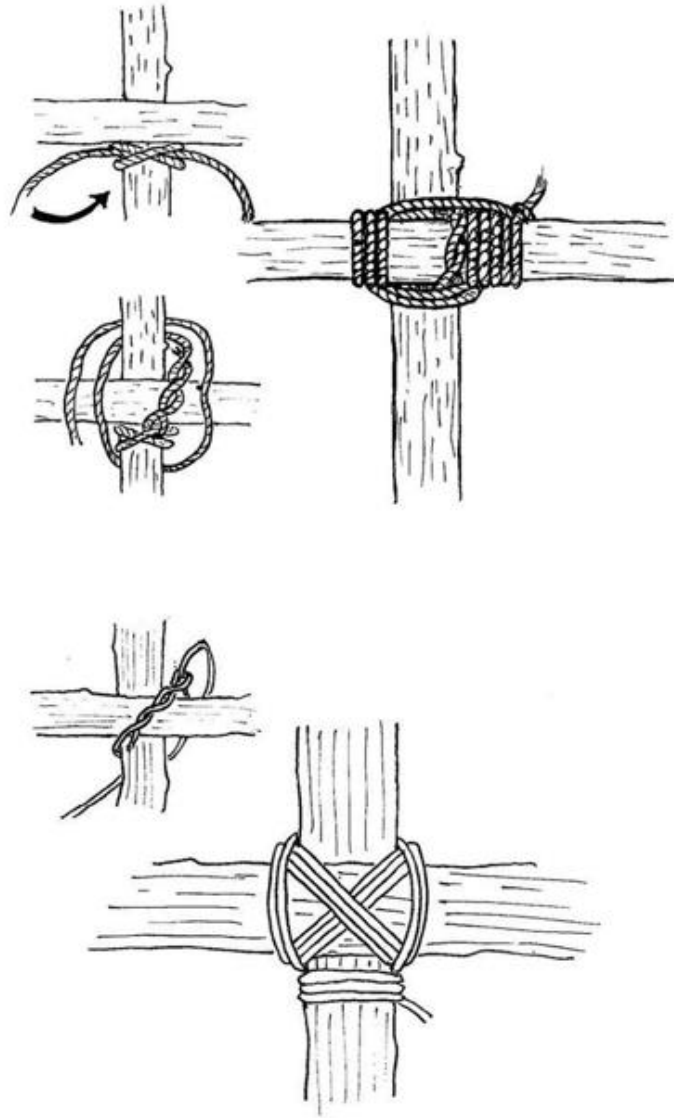
A very strong and secure lashing, but requires quite a bit of cordage. Used for joining two posts that cross at right angles to each other. Start with a clove hitch on the lowest post and wrap the running end behind and in front of both posts, as shown. Pull as tight as you can with each turn, maintaining the tension. Leave enough cordage to make several 'frapping turns' around the lashing, as shown, to pull it tighter still. (A frapping turn passes around the lashing, pulling the opposing sides closer and eliminating any slack.) When using large ropes around thick posts, beating the lashing with a heavy stick with each frapping turn will help you get the frapping turns really tight. Finish with several half hitches on one of the horizontal posts.

Diagonal lashing

A simple and quick lashing for posts that may not cross at right angles to one another. Start with a timber hitch wrapped diagonally around the overlapping posts and continue to wrap around, pulling tight with each turn. Switch direction and take the turns diagonally around the posts to form a cross where the cordage overlaps. Finish off with frapping turns around the whole lashing and a minimum of two half hitches on the lower post.

89. Lashings using cordage

The three steps below show a square lashing.
The two below show a diagonal lashing.



CAMP CRAFTS USING CORDAGE

In addition to making long lengths of string or cordage, these skills, plus a knowledge of how plant fibres behave as they're worked, can help you create some useful crafts.

Weaving

Mats can be made very easily using natural materials, and have endless uses around camp. Shelter doors, underground oven covers, improvised water filters and really thick and comfy mattresses can all be knocked up fast – you just need to have the right resources to hand. Dried grasses and reeds are simple to collect in quantity and are perfect to form the bulk of your mat. Bundle them up in sections to make the

individual warps, which will be 'sewn' together with your natural cordage. The thickness of your bundles depends entirely on what you intend to make.

For speed, the lengths of cordage material, which will become your 'wefts' for weaving over and under your bundled 'warps', can be fairly unrefined lengths of inner bark or roots – two materials that are most likely to be found in long lengths without having to be twisted or joined. This method, although quicker, will never be as strong as using proper laid cordage, so it should be used for mats that are not expected to get a lot of use.

Double your cordage over to form two 'running ends', and, starting with your first bundle, weave one running end below it and one over the top, crossing where they meet, and pulling both nice and tight. The next bundle is slid into place alongside and the running ends are again wrapped tightly around it, one over the top and one underneath, and so you continue with your rudimentary running stitch until all your bundles have been sewn, or woven together securely. You might need only one line of wefts at either end of the warp material to hold it together, but for wide sections of weaving you may need to include more intermediate lines for strength.

Coiling

Baskets in the style of traditional 'sleps', or beehives, can be made in a similar way. Start off with a bundle of long dried grasses and whip a length of nettle fibre or inner bark around it tightly for about 15cm/6in. Coil this tightly wrapped bundle to form the start of a spiral, and, using the cordage fibres, sew the inner bundle to the outer bundle. Carry on coiling in this same manner, adding in extra materials as you go and increasing the sewn lines of cordage that radiate out from the central spiral to hold it all tightly together. A hollow bone awl is useful to separate the coils when sewing. When you feel you have coiled a wide enough base, begin to build upwards in the same spiralling manner until you have enough height. These baskets are surprisingly strong and can have a bentwood or natural cordage handle built in as you near the rim to finish it off.

Coiled grass baskets are extremely useful and an excellent campfire project, but you can't help feeling, as you proudly survey your creation, that you've effectively crafted a woodland wastepaper bin. Now for your next project: a hand-carved magazine rack!

NATURAL GLUE AND SEALANT

There will be a number of occasions on which your campfire project or survival weapon cries out for a spot of glue or a waterproof sealant of some sort. One example of a natural alternative for both that can be found easily all over the place is pine resin. This solidified off-white resin leaks out of wounds in the bark of many coniferous trees and can easily be chipped off and stored for crafts. Heat it next to the fire in an old pot or on a hot stone and it'll melt into a stodgy liquefied version of itself. Mix in some powdered charcoal and a bit of beeswax (if you can get it) and apply it while it's hot. A glowing ember from the fire can be held near to soften any areas that have hardened too soon.

For spearheads and fish-hook barbs, use it like hot melt adhesive and coat both wood and bone or stone liberally before fitting both surfaces together. Use more to apply a waterproof coating to any lashings made from natural fibres. You can even paint it on the inside of your coiled grass basket to make a watertight container, making it nice and smooth by rolling a hot, round pebble around the inside.

SUMMARY

And so, all too soon, we reach the end of the book. I hope the words contained within have proved useful, maybe even motivating. I hope that you will have seen much of what has been described as being thoroughly enjoyable to learn and completely achievable, as was my intention. Even though, in theory, this book has covered only the basic foundations of wilderness survival, this is a vital learning stage where you're allowed to make your mistakes on a small scale. I've always been of the opinion that if you can carve a spatula then you can carve a paddle, if you can weave a bender shelter then you can make a coracle and if you can build a bird cage trap then you should be able to build a log cabin. As you master the foundation skills, more ambitious projects and adventures become highly realistic and achievable. I also hope that you find time to get out and try at least some of the skills I have written about because, based on my own experience, gradually incorporating wilderness survival skills and bushcraft into your life seems to complete some missing parts of the jigsaw. It has taught me respect for others and the world around us and the importance of balance in all things. It has also given me confidence in my abilities. I hope it does the same for you.

LIST OF PLANTS

Ash *Fraxinus excelsior*
Beech *Fagus sylvatica*
Bracken *Pteridium aquilinum*
Bramble (blackberry) *Rubus fruticosus*
Burdock *Arctium* spp.
Cattail (greater reedmace) *Typha* spp.
Chicken of the woods *Laetiporus sulphureus*
Common puffball *Lycoperdon perlatum*
Crab apple *Malus sylvestris*
Cramp balls *Dalmanella concentrica*
Dogrose (rosehip) *Rosa canina*
Fat hen *Chenopodium album*
Foxglove *Digitalis* spp.
Goose grass (cleavers) *Gallium aparine*
Grand fir *Abies grandis*
Greater plantain *Plantago major*
Hairy bittercress *Cardamine hirsuta*
Hawthorn *Crataegus monogyna*
Hazel *Corylus avellana*
Hedge garlic *Alliaria petiolata*
Holly *Ilex* spp.
Honeysuckle *Lonicera* spp.
Horse chestnut *Aesculus hippocastanum*
Horse hoof fungus *Fomes fomentarius*
Lesser celandine *Ranunculus ficaria*
Lime *Tilia* spp.
Oak *Quercus* spp.
Pendulous sedge *Carex pendula*
Red campion *Silene dioica*
Ribwort plantain *Plantago lanceolata*
Scots pine *Pinus sylvestris*
Silver birch *Betula pendula*
Silverweed *Argentina anserina*
Soapwort *Saponaria officinalis*
Spruce *Picea* spp.
Stinging nettle *Urtica dioica*
Sugar maple *Acer saccharum*
Sweet chestnut *Castanea sativa*
Thistle *Cirsium* spp.
Western red cedar *Thuja plicata*
Wild garlic (Ramsons) *Allium ursinum*
Wild strawberry *Fragaria vesca*
Willow *Salix* spp.
Wood sorrell *Oxalis acetosella*
Yew *Taxus baccata*

Yucca Yucca spp.

RECOMMENDED READING

- Food for Free, Richard Mabey, HarperCollins Publishers, London, 2007
- Field Guide to Mushrooms of Britain and Europe, Helmut and Renate Grunert, The Crowood Press Ltd, Marlborough, 1991
- Mushrooms, Roger Phillips, Pan Macmillan Ltd, London, 2006
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- Wild Food, Roger Phillips, Pan Macmillan Ltd, London, 2007
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Print edition first published in the UK and USA 2010 by
Watkins Publishing, Sixth Floor, Castle House,
75–76 Wells Street, London W1T 3QH
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Designed by Jerry Goldie

Printed and bound Imago in China

British Library Cataloguing-in-Publication Data Available
Library of Congress Cataloging-in-Publication Data Available
ISBN: 978-1-78028-235-0
www.watkinspublishing.co.uk